Task C: Supporting Electricity Sector Reform

Deliverable 2.2.: Process mapping & identification gaps of staff skills and performance
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The process mapping & gap analysis in staff, skills, performance report is the second part of the Institutional development phase of Task C

Task C project plan

1. Project set-up / Inception report
   1.1 Data collection
   1.2 Methodology, team and approach validation

2. Institutional Development
   2.1 Strategy for institutional development
   2.2 Process mapping & identification of gaps in staff, skills, perform.
   2.3 Manpower / org. rationalization review
   2.4 ERP System review

3. Financial performance assessment & financial models
   3.1 Tariff framework review
   3.2 Tariff structure set-up and reform pathway
   3.3 Tools (excel model) & Trainings

4. Customer service performance improvement
   4.1 Improving financial performance of customer service
   4.2 Improving technical performance

5. Review and final report
   5.1 Findings review and final report

6. Workshop & Training

7. PMO (progress reporting)

Source: Task C inception report
The report focused on 5 key processes, functional to help GECOL responding to the issues identified with Task A (Rapid sector assessment)

<table>
<thead>
<tr>
<th>Issues identified in the rapid sector assessment</th>
<th>Increases of costs</th>
<th>Increasingly unbalanced tariff framework</th>
<th>Raising commercial losses and limited collection ability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worsening sector technical performances</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Process identified for each issue</th>
<th>Process Owner</th>
<th>Key area impacted by the issue and related process</th>
<th>Questions addressed to improve the process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance</td>
<td>Transmission Department</td>
<td>Maintenance</td>
<td>How many types of maintenance does the Transmission Department in GECOL carry out? How are yearly plans developed and managed between two separate processes (opex, capex) How is the budget developed and approved? How does the budget processes looks like</td>
</tr>
<tr>
<td>Budgeting (OPEX)</td>
<td>Financial Affairs Department</td>
<td>Budgeting</td>
<td>Who is in charge of billing and collecting the invoices? How does the process start and end</td>
</tr>
<tr>
<td>Budgeting (CAPEX)</td>
<td>Contracts and Development Department</td>
<td>Consumer Services</td>
<td></td>
</tr>
<tr>
<td>Invoicing / Billing</td>
<td>Customers Service Department</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash Collection</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: process have been identified in accordance and alignment with GECOL project team
The approach used for the process mapping & identification of gaps have been different depending on the data and information availability.

### Task C Phase

| 2 | GECOL Institutional development |

#### Task C Step

| 2.2 | Process mapping & identification of gaps in staff / skills & performance |

#### Approach / methodology

<table>
<thead>
<tr>
<th>A</th>
<th>Data available</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>No data / information available</td>
</tr>
</tbody>
</table>

#### Description of the AS-IS process

- Analysis of the ideal process based on best practices
- Identification of gaps / key issues
- Definition of the mitigation / improvement areas
- Design of the TO-BE / improved process

#### Identification of mitigation / improvement areas

- Interviews with GECOL / process owner
- Review of international best practices

#### Design of the TO-BE / improved process

*Note: Not all processes and information could be analysed on a bottom-up basis (Approach A)*
Maintenance Process (Transmission)

Budget Process

OPEX Budget

CAPEX (Development) Budget

Invoicing/Collection Process

Appendix – Price Control Case Study
GECOL transmission BU is mainly focused on maintenance activities, and was thus selected as proxy for this maintenance process mapping exercise.

Organization of GECOL transmission department

- The Transmission general department includes 9 departments and 43 sub-departments;
- The Transmission general department activities does not include:
  - Commercial activities;
  - Transmission projects activities.

Source: GECOL
GECOL transmission department today is composed by 2,444 FTE, mostly technicians & engineers

<table>
<thead>
<tr>
<th>Staff Specifications</th>
<th>#FTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admin</td>
<td>82</td>
</tr>
<tr>
<td>Drivers</td>
<td>87</td>
</tr>
<tr>
<td>Engineers</td>
<td>691</td>
</tr>
<tr>
<td>Financial</td>
<td>20</td>
</tr>
<tr>
<td>Software</td>
<td>23</td>
</tr>
<tr>
<td>Research</td>
<td>2</td>
</tr>
<tr>
<td>Services [manual]</td>
<td>36</td>
</tr>
<tr>
<td>Technician</td>
<td>1,502</td>
</tr>
<tr>
<td>Translators</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>2,444</td>
</tr>
</tbody>
</table>

90% of the general transmission department staff are technicians and engineers

Source: GECOL
The department today manages over 30k km of HV lines and almost 300 substations

GECOL Transmission Network

<table>
<thead>
<tr>
<th>Voltage level</th>
<th>Lines (km)</th>
<th>No. of Substations</th>
<th>Substation Capacity (MVA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 kV</td>
<td>2,290</td>
<td>14</td>
<td>9,600</td>
</tr>
<tr>
<td>220 kV</td>
<td>13,706</td>
<td>81</td>
<td>15,458</td>
</tr>
<tr>
<td>66 kV</td>
<td>14,311</td>
<td>195</td>
<td>4,359</td>
</tr>
<tr>
<td>Total</td>
<td>30,307</td>
<td>290</td>
<td>29,417</td>
</tr>
</tbody>
</table>

Lifetime of GECOL 220 kV substations

<table>
<thead>
<tr>
<th>Region</th>
<th>Average Commissioning Year</th>
<th>Remaining life time*</th>
</tr>
</thead>
<tbody>
<tr>
<td>West region</td>
<td>1984</td>
<td>28%</td>
</tr>
<tr>
<td>Tripoli region</td>
<td>1991</td>
<td>42%</td>
</tr>
<tr>
<td>Central region</td>
<td>1989</td>
<td>38%</td>
</tr>
<tr>
<td>Sebha region</td>
<td>1999</td>
<td>60%</td>
</tr>
<tr>
<td>Kufra region</td>
<td>1988</td>
<td>36%</td>
</tr>
<tr>
<td>Benghazi region</td>
<td>1990</td>
<td>40%</td>
</tr>
<tr>
<td>East region</td>
<td>1985</td>
<td>28%</td>
</tr>
<tr>
<td>GECOL</td>
<td>1990</td>
<td>39%</td>
</tr>
</tbody>
</table>

* Assuming 45 years life time of substation

- The oldest substation in operation was commissioned on 1974 (Agelat substation)
- The newest substation in operation was commissioned on 2012 (RIYADIA substation)
- The average commissioning year of all operating substations is ~1990.

- The oldest is the network the more emphasis on the importance of the maintenance.
- The substations in the West and East regions have the least remaining lifetime, which shall be considered by GECOL when planning for maintenance and spare parts.

Source: GECOL
GECOL currently uses three different types of maintenance approaches to maintain the network

Overview of maintenance approaches in use

<table>
<thead>
<tr>
<th></th>
<th>Preventive maintenance</th>
<th>Predictive - Condition Based maintenance</th>
<th>Corrective (breakdown) maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition</td>
<td>Maintenance approach that is regularly performed on an equipment to check the likelihood of its failing. Preventative maintenance is performed while the equipment is still working, so that it does not break unexpectedly.</td>
<td>Maintenance approach that is performed to predict when equipment failure might occur (that monitors the actual condition of the asset to decide if maintenance needs to be done).</td>
<td>Maintenance approach that is performed when equipment failure occurs</td>
</tr>
</tbody>
</table>
| Criteria used by GECOL | • For all substations equipment  
• For high voltage lines  
• For substations indoor feeders  
• For lines remote protection  
• For load shedding scheduling | • For all substations equipment  
• For high voltage lines | • When equipment fails |
| Frequent | Scheduled (Periodically)  
Daily, weekly, monthly, semi-annually, annually etc | Triggered by asset/equipment condition | Triggered by failure |

Source: GECOL, PwC
GECOL maintenance activities are initiated by the maintenance programming department which prepares yearly the maintenance plan.

1- Substations preventive and predictive maintenance
   - It includes predictive and preventive plan for 97 substations in 12 areas in the year
   - It sets the maintenance period (starting date and the end date) for each substation

2- Indoor feeders preventive maintenance
   - It includes preventive plan for the indoor feeders in 80 substations in 2 regions (Eastern & Western) in the year
   - It sets the maintenance period (starting date and the end date) for each substation

3- Lines Remote protection schedule
   - It includes preventive plan for 108 high voltage lines in 2 regions (Eastern & Western) in the year
   - It sets the maintenance period (starting date and the end date) for each substation

4- Load shedding Testing schedule
   - It includes preventive plan for 63 substations in 12 areas in the 4 quarters
   - It sets the maintenance period (starting date and the end date) for each substation

5 Transmission lines preventive and predictive maintenance
   - It includes predictive and preventive plan for 175 line (220 & 400 kV) in 2 regions (Eastern & Western) in the year
   - It includes cleaning plan for 154 lines (220 kV) in 2 regions (Eastern & Western) in the year
   - It sets the maintenance period (starting date and the end date) for each line

GECOL do not use its ERP system for preparing the maintenance plan.

Source: Transmission Department – 2017 maintenance plan
Baseline analyses identified that the execution of GECOL maintenance plan is often interrupted by many unscheduled maintenance Work Orders (WO)

- In 2015 GECOL maintenance plan aimed at execution of 12,576 maintenance work order but only succeeded in executing 8,027 (i.e. 63.8% completion rate).
- In addition to the WO included in the maintenance plan, GECOL had 8,894 emergency/unscheduled/unplanned maintenance work orders and executed 8,113 work order out of them (i.e. 91.2% completion rate)

- During the last period, the execution of maintenance plan is **negatively** affected by:
  1. Security situation
  2. Receiving emergency/unscheduled/unplanned maintenance work orders
  3. Lack of some tools in particular service vehicles (cranes, forks utility vehicles, etc.)
- In 2012 GECOL contracted local contractors to assist in the maintenance of the 400KV & 230 KV lines and achieved the highest completion rate in the period 2012-2015

Source: Transmission Department – Annual reports
Benchmarking GECOL maintenance critical success factors against best practice highlighted a number of gaps

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Maintenance Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inventory of Assets</strong></td>
<td><strong>Documentation</strong></td>
<td><strong>Staff</strong></td>
<td><strong>Tools</strong></td>
<td><strong>Processes &amp; Procedures</strong></td>
<td><strong>Aims at:</strong></td>
</tr>
</tbody>
</table>
| ・ Equipment inventory/Assets registrar  
・ Planned replacement (spare parts)  
・ Critically ranking - Prioritize | ・ Manufacturer manual & data sheets. Reference materials  
・ Health check list  
・ Historical performance records | ・ Staff selection and specifications  
・ Training | ・ Right tool for the job  
・ In good condition | ・ Maintenance Processes  
・ A clear step-by-step inspection instructions procedures including safety requirements  
・ Includes man hour to execute the procedure to calculate cost | ❖ Improve system reliability  
❖ Decrease cost of replacement  
❖ Decreases system downtime  
❖ Reduce injury  
❖ Usage of Computerized Maintenance Management System (CMMS) |
| **Gaps within GECOL** | | | | | **Does not include maintenance cost parameters** |
| ・ Involved only in the initial the preparation of the spare parts needs  
・ Do not critically rank (prioritize) the assets | ・ Has a full documentati on of main equipment / assets including health check list | ・ Training restarted in 2015 in a small scale | ・ Missing some tools (specially vehicles)  
・ Missing state of art tools such as live-line maintenance and drone inspection | ・ Does not use the features of the ERP system to be able to use it as CMMS and generate the maintenance plan |
GECOL should consider to critically rank its equipment / assets and the involvement of its maintenance team in spare parts planning to increase its maintenance efficiency

Illustrative example of assets ranking for maintenance purposes that GECOL may adopt

<table>
<thead>
<tr>
<th>Rank</th>
<th>Effect</th>
<th>Consequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minimal</td>
<td>The failure will cause <strong>minimum</strong> reduction of operation or will require <strong>minimum</strong> investment to restore full operations.</td>
</tr>
<tr>
<td>2</td>
<td>Marginal</td>
<td>The failure will have impact on the network and may have to shut down. <strong>Some</strong> investment may be necessary to restore operation</td>
</tr>
<tr>
<td>3</td>
<td>Critical</td>
<td>Will cause <strong>personal injury</strong> and or <strong>considerable</strong> economic damage. Failure will force part of network or facility to shutdown its operation immediately and temporarily and would require significant investment</td>
</tr>
<tr>
<td>4</td>
<td>Catastrophic</td>
<td>Will cause <strong>death</strong> or multiple death or injuries or impact on operations will be <strong>disastrous</strong> which will shutdown the network of facility in long-term.</td>
</tr>
</tbody>
</table>

Assets to be critically ranked according to their failure consequence effect and GECOL to include ranking in the preventive maintenance approach criteria

GECOL maintenance team participates in the initial planning for spare parts but not in the final decision

The maintenance team is to participate in the final decision in spare parts planning and to share information for forecasting the needs of spare parts, due to:
1. Their knowledge of the conditions of different equipment / assets
2. Optimizing spare parts based on assets / equipment ranking
In addition GECOL shall take advantage of the ERP features to enhance maintenance planning and monitoring

- CMMS can decrease the cost of labor by automating job functions and completing them more accurately and on time.
- CMMS gives the ability to use the historical data gathered to make more informed maintenance decisions.
- Access to this data allows GECOL to identify trends, better understand maintenance costs, and improve inventory control.
The “AS-IS” Preventive Maintenance (PM) process in GECOL could be summarized in 12 sequential steps

AS-IS Preventive maintenance process

**Operation**

**Maintenance department admin**

1. Issue PM schedule (list of working orders)
   - Based on Maintenance Plan or unscheduled WO

2. Receive/Review PM WO

3. Receive PM work order

4. Coordinate with operation

5. Perform maintenance procedure inspection tasks incl. HS

6. Shut down Process

**Supervisor**

7. Check if shutdown is required

8. Results are ok

9. Work order complete

10. Report to supervisor

11. Validate W/O

12. Yes

   - update w.o status to close
   - Update assets condition
   - Report to Admin

13. Report to supervisor

**Maintenance team**

Three types of work permission are given by the operation:

- A: direct maintenance on the equipment (After shutdown), mechanical
- B: Conduct testing on the equipment (After shutdown), Protective
- C: Visual check

**Source:** PwC Interviews
The “AS-IS” Predictive - Condition Based maintenance process is carried out through 17 key processes

AS-IS Predictive- Condition Based maintenance process

Source: PwC Interviews

* Predictive maintenance WO that needs special tools (such as thermography) to monitor the equipment’s are included in the maintenance plan and performed by the maintenance team
**From the analysis of the AS-IS transmission maintenance processes, we identified four issues to be considered by GECOL going forward**

### Issues related to GECOL transmission maintenance process

1. **Ranking/Prioritization**
   - GECOL is missing the ranking among the different assets to determine the order of each in the maintenance plan and to separate what must be done now from what can be done later.

2. **CMMS**
   - GECOL does not take advantage of the functions existing in its ERP system. Maintenance plan, WO, scheduling etc. shall go through the CMMS to enable monitoring and calculating costs.

3. **Local contractors**
   - GECOL used local contractors in 2012 which increased the efficiency of maintenance. GECOL to assess the potential of using such contractors.

4. **Cost**
   - GECOL maintenance report are missing the information related to the maintenance cost and budget.
GECOL maintenance workflow process should be aligned to best practice by ranking, inclusion of costing parameters and by using CMMS

Existing vs. To-Be maintenance work-flow process

Existing Workflow Process:
- Maintenance Plan
- Schedule WO for next period
- Allocate WO to the teams
- Execute WO
- Feedback & Reporting
- Unscheduled WO

Workflow Process aligned to best practice:
- Maintenance Plan
- Calculate & Authorize cost
- Prioritize WO
- Schedule WO for next period
- Allocate WO to the teams
- Execute WO
- Feedback, costing & Reporting
- Unscheduled WO
- Allocate WO to local contractors
- Continuous Improvement
The “To-Be” Preventive Maintenance (PM) process envisions more responsibilities for the maintenance adm department & supervisors...
... Similarly to the new Predictive - Condition Based Maintenance process

To-Be Predictive – Condition based maintenance process

1. Regular examination (monitoring of equipment)
   → 2. Compare equipment real condition against equipment checklist

3. deviation
   ▶ 3.1 No
   ▶ 3.2 Yes
     ▶ 3.2.1 Work order complete
     ▶ 3.2.2 Issue materials requested
     ▶ 3.2.3 Material receive process

4. Work order identification
   → 5. Calculate cost using CMMS
   → 6. Prioritize WO
   ▶ 7. WO to be executed by local contractor
     ▶ 7.1 Yes
     ▶ 7.2 No

8. Approval received
   → 9. Approval received

10. Receive/Review PM work order
    → 11. Check if shutdown is required
        ▶ 11.1 No
        ▶ 11.2 Yes
          ▶ 11.2.1 Work order to be executed by local contractor
          ▶ 11.2.2 Validate W/O

12. Coordinate with operation
    → 13. Shutdown Process

14. Check if materials needed
    ▶ 14.1 No
    ▶ 14.2 Yes
      ▶ 14.2.1 Issue materials
      ▶ 14.2.2 Material receive process

15. Issue materials requested
    → 16. Material receive process

17. Receive PM work order

18. Work order execution

19. Work order complete
    ▶ 19.1 Yes
    ▶ 19.2 No
      ▶ 19.2.1 Report to supervisors

20. Material receive process
    ▶ 20.1 No
    ▶ 20.2 Yes
      ▶ 20.2.1 Update w.o status

21. Validate W/O
    ▶ 21.1 Yes
    ▶ 21.2 No
      ▶ 21.2.1 Update assets condition

22. Receive PM work order
    ▶ 22.1 Continue at step 5
    ▶ 22.2 Issue invoice

Source: PwC

Task C: Supporting Electricity Sector Reform

Strictly private and confidential

PwC

Final

14 December 2017

21
**GECOL management should also use new technical and financial KPI’s to measure the quality and effectiveness of implementation of their maintenance plan**

### Recommended maintenance KPIs

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Calculation formula</th>
<th>Status in GECOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance of substations %</td>
<td>Number of maintained substations</td>
<td>🟢</td>
</tr>
<tr>
<td></td>
<td>Number of substations planned to be maintained</td>
<td></td>
</tr>
<tr>
<td>Maintenance of high voltage lines %</td>
<td>Number of maintained lines</td>
<td>🟢</td>
</tr>
<tr>
<td></td>
<td>Number of lines planned to be maintained</td>
<td></td>
</tr>
<tr>
<td>Cleaning of high voltage lines %</td>
<td>Number of cleaned lines</td>
<td>🟢</td>
</tr>
<tr>
<td></td>
<td>Number of lines planned to be maintained</td>
<td></td>
</tr>
<tr>
<td>Maintenance of fiber network %</td>
<td>Number of maintained fiber lines</td>
<td>🟢</td>
</tr>
<tr>
<td></td>
<td>Number of fiber lines planned to be maintained</td>
<td></td>
</tr>
<tr>
<td>Equipment availability %</td>
<td>= Hours each equipment is available to run at capacity</td>
<td>🟢</td>
</tr>
<tr>
<td></td>
<td>= Total hours during the reporting time period</td>
<td></td>
</tr>
<tr>
<td>Schedule compliance %</td>
<td>= Total hours worked on scheduled jobs</td>
<td>🟢</td>
</tr>
<tr>
<td></td>
<td>Total hours scheduled</td>
<td></td>
</tr>
<tr>
<td>Emergency maintenance %</td>
<td>= Total hours worked on emergency jobs</td>
<td>🟢</td>
</tr>
<tr>
<td></td>
<td>Total hours worked</td>
<td></td>
</tr>
<tr>
<td>Maintenance overtime %</td>
<td>= Total maintenance overtime during period</td>
<td>🟢</td>
</tr>
<tr>
<td></td>
<td>= Total regular maintenance hour during period</td>
<td></td>
</tr>
<tr>
<td>Preventive maintenance completion %</td>
<td>= Preventive maintenance actions completed</td>
<td>🟢</td>
</tr>
<tr>
<td></td>
<td>Preventive maintenance actions scheduled</td>
<td></td>
</tr>
<tr>
<td>Maintenance cost/budget %</td>
<td>= Total maintenance cost</td>
<td>🟢</td>
</tr>
<tr>
<td></td>
<td>Total maintenance budget</td>
<td></td>
</tr>
<tr>
<td>Work orders completion %</td>
<td>= Work orders closed</td>
<td>🟢</td>
</tr>
<tr>
<td></td>
<td>Work orders generated</td>
<td></td>
</tr>
</tbody>
</table>

Used by GECOL  
Recommended to be used by GECOL
Maintenance Process (Transmission)

Budget Process

OPEX Budget

CAPEX (Development) Budget

Invoicing/Collection Process

Appendix – Price Control Case Study
Budgeting within GECOL is split into two separate processes, one for operations (OPEX) and one for development projects (CAPEX)

Evolution of GECOL budgeting process and related stakeholders

- **Law 17** - GECOL Establishment and assigning its responsibilities
- Development projects (essentially expansions to the infrastructure) were handled then by the Secretary of Electricity with some minor to none follow-up from GECOL’s Planning Department

- **Law 17** - was amended in **1993** to entrust GECOL with the planning, budgeting, tendering, contracting, and execution of development projects
- Consequently between **1993** and **1999** GECOL embedded these new activities in its mandate (Planning & Projects, Budget and Finance)

- **1999**, GECOL established a new General Department, Contracts & Development Accounts, for Budgeting, Contract preparation and Projects Accounting

- **In 1999**, GECOL established a new General Department, Contracts & Development Accounts, for Budgeting, Contract preparation and Projects Accounting

- **In 2002**, the Planning & Projects GD was split in two separate GDs:
  - Studies & Planning GD for planning and tendering
  - Projects GD for following-up on project execution


- **In 2009**, Projects GD have been divided into 3 separate GDs dealing with Generation, Transmission and Distribution

**Several legal and structural implications explains the reason behind the split**

*Source: PwC analysis*
Maintenance Process (Transmission)

Budget Process

OPEX Budget

CAPEX (Development) Budget

Invoicing/Collection Process

Appendix – Price Control Case Study
The operating expenses (OPEX) budget covers GECOL operating expenses for its normal operations during the whole year.

## Characteristics of GECOL OPEX budget process

<table>
<thead>
<tr>
<th>Scope</th>
<th>Phases</th>
<th>Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expenses related mainly to operations, typically, smaller investments that only require expenditures within the annual budgeting period (e.g. Maintenance).</td>
<td>OPEX budgeting cycle is split into two phases: Preparation phase; and Completion (approval &amp; dissemination) phase</td>
<td>OPEX budgeting process runs from October till March/April each year.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Committee</th>
<th>Budget reallocation</th>
<th>Sources of Fund</th>
</tr>
</thead>
<tbody>
<tr>
<td>A budget committee comprised of all GECO general managers and chaired by the finance general manager oversee the budget cycle.</td>
<td>Any department can request additional budget during the year. The finance GM is in the power to approve/reject such request based on the impact of budget reduction on other departments.</td>
<td>GECOL’s income (with subsidy from Government Chapter 4 to cover the deficit). Deficit is usually used to cover salaries.</td>
</tr>
</tbody>
</table>

**Highest Authorities to Approve**

GECOL’s General Assembly.

*Source: PwC analysis*
The financial affairs general department has the major role in the OPEX budget preparation.

GECOL Financial affairs department organization

![Diagram showing the organization of the financial affairs department]

- **Executive Manager**
- **Financial Affairs General Department**
- **General Manager Assistance for regions accounting**
- **General Manager Assistance for Financial Planning**
- **Accounting department**
- **Materials accounting department**
- **Administrative affairs**

**Legend**
- Assistant
- Department
- Sub-department

Financial departments in the different regions
- Budget sub-department
- Financial follow up sub-department
- Strategic finance sub-department

- Assets management sub-department
- General ledger & financial reporting sub-department
- Financial planning sub-department

- Finance sub-department
- Risk management sub-department
- Costing sub-department

Material accounting sub-department
Fuel accounting sub-department

The financial planning department includes 6 sub-departments, with key tasks being the preparation of budget.

Source: GECOL

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PwC
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14 December 2017
GECOL’s OPEX Budget is split into 7 general expense categories

GECOL’s OPEX Budget – General Categories

<table>
<thead>
<tr>
<th>General Category</th>
<th>Main Sub-Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Salaries</td>
</tr>
<tr>
<td></td>
<td>‣ Basic salaries</td>
</tr>
<tr>
<td></td>
<td>‣ Benefits</td>
</tr>
<tr>
<td></td>
<td>‣ Overtime</td>
</tr>
<tr>
<td></td>
<td>‣ Social security</td>
</tr>
<tr>
<td></td>
<td>‣ Other</td>
</tr>
<tr>
<td>2</td>
<td>Fuel</td>
</tr>
<tr>
<td></td>
<td>‣ Heavy/ Light fuel</td>
</tr>
<tr>
<td></td>
<td>‣ Natural gas</td>
</tr>
<tr>
<td></td>
<td>‣ Lubricants</td>
</tr>
<tr>
<td></td>
<td>‣ Other</td>
</tr>
<tr>
<td>3</td>
<td>Material &amp; Spare parts</td>
</tr>
<tr>
<td></td>
<td>‣ Chemicals</td>
</tr>
<tr>
<td></td>
<td>‣ Spare parts for generation/transmission/distribution stations</td>
</tr>
<tr>
<td></td>
<td>‣ Spare parts vehicles and cars</td>
</tr>
<tr>
<td></td>
<td>‣ Spare parts street lighting</td>
</tr>
<tr>
<td></td>
<td>‣ Fuel and oil for vehicles and cars</td>
</tr>
<tr>
<td></td>
<td>‣ Other</td>
</tr>
<tr>
<td>4</td>
<td>Financial Expenses &amp; Power Purchase</td>
</tr>
<tr>
<td></td>
<td>‣ Customs, Maritime expenses</td>
</tr>
<tr>
<td></td>
<td>‣ Bank expenses</td>
</tr>
<tr>
<td></td>
<td>‣ Power purchase</td>
</tr>
<tr>
<td></td>
<td>‣ Other</td>
</tr>
<tr>
<td>5</td>
<td>Other Services</td>
</tr>
<tr>
<td></td>
<td>‣ Travel expenses</td>
</tr>
<tr>
<td></td>
<td>‣ Lodging allowances</td>
</tr>
<tr>
<td></td>
<td>‣ Ports and airport expenses</td>
</tr>
<tr>
<td></td>
<td>‣ Other</td>
</tr>
<tr>
<td>6</td>
<td>Capital Expenditures</td>
</tr>
<tr>
<td></td>
<td>‣ Cars and vehicles</td>
</tr>
<tr>
<td></td>
<td>‣ IT equipment</td>
</tr>
<tr>
<td></td>
<td>‣ Training</td>
</tr>
<tr>
<td></td>
<td>‣ Other</td>
</tr>
</tbody>
</table>

Source: Finance General Department, PwC Analysis
The budget is allocated across 21 primary Cost Centres (CS) and secondary CS, all of them with a great degree of autonomy over budget expenditure ...

GECOL’s Budget Main and Secondary Cost Centres (2017)

**Financial Affairs**
- Tripoli
- Gheryan
- Tubrok
- Western Mountain
- Benghazi
- Al-Merkab
- Tarhuna
- Western coast

**Planning & Studies**
- Central

**ICT**
- Southern

**Generation Projects**
- Western

**Transmission Projects**
- Eastern
- Central

**Control & Supervision**
- Western

**Generation**
- Eastern

**Control**
- Western
- Eastern

**Transmission**
- Western

**Distribution**
- Eastern
- Central
- Western
- Southern
- Western Mountain
- Benghazi
- Al-Merkab
- Al-Khaleej
- Tarhuna
- Jfara

CS have a high degree of autonomy in their budget expenditure.

Source: GECOL Finance & Budget General Department, PwC
... However, main and secondary CS are only engaged in the initial preparation phase of the OPEX budget

Issues identified

- Requests, data gathering and consolidation are done manually
  - Mostly, each CS relies on the previous year budget while estimating the current budget (Essentially an extension of the past; not based on clearly articulated operational plans)

- GECOL’s budget depends largely on the deficit that the General Assembly and the MoF are willing/able to finance.
  - CS are not engaged in the finalization phase

Source: PwC interviews and analysis
The “AS-IS” GECOL’s OPEX budgeting cycle is split into two phases (Prep and Finalize) and runs yearly from Oct till Mar/Apr.

<table>
<thead>
<tr>
<th>General Assembly</th>
<th>OPEX Budget Preparation</th>
<th>OPEX Budget Finalization</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Data gathering and consolidation are done manually</td>
<td></td>
</tr>
<tr>
<td>MD</td>
<td></td>
<td>10 Review &amp; accept</td>
</tr>
<tr>
<td>Budget Committee</td>
<td></td>
<td>11 Finalize Allocation and determine reserves</td>
</tr>
<tr>
<td>Finance – Financial Planning</td>
<td>Gather data &amp; prepare requests</td>
<td>6 Consolidate data and estimate salaries</td>
</tr>
<tr>
<td>Generation</td>
<td>2 Estimate electricity &amp; water production, fuel and other requirements (excl. salaries)</td>
<td>7 Develop Estimated Budget</td>
</tr>
<tr>
<td>Distribution/Consumer services</td>
<td>Estimate electricity sales and other requirements (excl. salaries)</td>
<td>9 Amend Estimated Budget</td>
</tr>
<tr>
<td>HR</td>
<td>4 Estimate manpower changes &amp; other requirements (excl. salaries)</td>
<td></td>
</tr>
<tr>
<td>Other Departments</td>
<td>5 Estimate requirements (excl. salaries)</td>
<td></td>
</tr>
</tbody>
</table>

Source: PwC interviews and analysis
After the finalization of the budget, reallocation can occur during the year (but the process show its done with limited involvement of the concerned General Managers)

Budget Re-Allocation Process across different divisions of the budget*

*) If the budget was to be transferred from the same class, the approval point will go up to the MD

Source: Finance GD Strategy & PwC analysis:
**A series of issues related to GECOL OPEX budget practices have been identified, the most important being prioritization and target setting**

### Issues related to the OPEX Budget

| **Prioritization** | • GECOL is missing the prioritization among the different items of OPEX to determine the order of each type of OPEX and to separate what must be done now from what can be done later |
| **Targets & efficiency factors** | • No targets for the different items of OPEX and the level of expenditures compatible with these targets to enhance operational efficiency  
  • No efficiency factors to reduce part of OPEX |
| **Coordination complexity** | • the finance departments (As per the Org chart) in each area has increased from 7 in 2010 to 15 in 2017 which creates coordination complexity. Using existing GECOL ERP system will reduce the complexity (automated system) |
| **Budget Approval** | • GECOL approve and allocate the budget before it is confirmed with the Government. |
| **Budget follow up** | • Budgets are separated for the areas which makes it hard to follow up which will result in diseconomies of scale and increase in costs. Using existing GECOL ERP system will enhance monitoring efficiency |
| **Budget committee** | • The budget committee has no role in setting up the budget |
| **Manual** | • The budgeting process is manual, and is compiled on Excel. Using existing GECOL ERP system will speed up the process (automated system) |
| **Transparency & accountability** | • GECOL budgeting process lacks transparency between the different departments and accountability of budgeting execution |
To respond to the issues identified, we recommend to increase the role of GECOL Budget committee, which shall set the budget criteria and decide on the OPEX budget (as response of the identified market challenges)

Example of GECOL budget committee role & responsibilities

<table>
<thead>
<tr>
<th>Cost item</th>
<th>Example of criteria for setting the targets</th>
</tr>
</thead>
</table>
| Salaries                         | • Freeze or reduce overtime  
                                      • Benchmark salaries between the regions and departments                                                 |
| Fuel                             | • Priority for Gas   
                                      • Generation to be done on Merit Order                                                                   |
| Material & Spare parts           | • Prepare a spare parts strategy for Generation, transmission and distribution                           |
| Maintenance                      | • Increase training activities  
                                      • Implementation of the recommendations in the ERP report                                                  |
| Other Services                   | • Business as usual                                                                                     |
| Financial Expenses & Power Purchase | • Increase training activities  
                                            • Implementation of remote meter reading/ revenue protection activities.  
                                            • Comparison between leasing and procuring                                                                |
| Capital Expenditures             | • Agreements with IPP’s and Renewable projects shall have the same priority as fuel                     |
| IPP’s and Renewable              |                                                                                                          |

MD to discuss and approve the criteria  
Planning department can be the secretariat of the budget committee
For example, GECOL Budget Committee would consider the challenges identified with the project and decide on the OPEX budget accordingly.

Example of GECOL budget committee responses to issues

<table>
<thead>
<tr>
<th>Example of challenge identified within the current project (Rapid Sector Assessment)</th>
<th>Example of response through OPEX budget by the Budget Committee</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power generation</strong></td>
<td></td>
</tr>
<tr>
<td>Efficiency &amp; affordability improv. through gas</td>
<td>Gas to have the highest fuel priority</td>
</tr>
<tr>
<td>Decreasing but unbalanced OPEX evolution</td>
<td>Costs can be increased only for efficiency improvement purposes (i.e. maintenance &amp; staff training)</td>
</tr>
<tr>
<td><strong>Transmission system</strong></td>
<td></td>
</tr>
<tr>
<td>Stable technical performance</td>
<td>Focus on staff training and to procurement/lease the missing important tools for maintenance</td>
</tr>
<tr>
<td>Heavy financial performance</td>
<td>Follow the recommendations in the man power sizing report</td>
</tr>
<tr>
<td><strong>Distribution and supply</strong></td>
<td></td>
</tr>
<tr>
<td>Constant and competitive technical performance</td>
<td>Focus on staff training</td>
</tr>
<tr>
<td>Heavy and worsening commercial situation</td>
<td>Implement ERP report recommendations</td>
</tr>
<tr>
<td>Increasing costs / overstaffing</td>
<td>Introduce energy efficiency measures</td>
</tr>
<tr>
<td>Unbalanced and no transparent tariff structure and framework</td>
<td>Follow the recommendations in the man power sizing report</td>
</tr>
<tr>
<td></td>
<td>Apply energy reduction incentives</td>
</tr>
</tbody>
</table>
In the new OPEX process, GECOL’s MD together with the Budgeting committee will set-up the prioritization policy and OPEX targets ...

TO-BE OPEX budgeting process

<table>
<thead>
<tr>
<th>Operating Budget Preparation</th>
<th>Operating Budget Finalization</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Government</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>General Assembly</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MD</strong></td>
<td></td>
</tr>
<tr>
<td>1 Set up Prioritization policy</td>
<td>13 Discuss with the Government</td>
</tr>
<tr>
<td>2 Setup the targets</td>
<td>14 Review &amp; accept</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Budget Committee</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Finance – Financial Planning</strong></td>
<td>9 Review if in Line with prioritization and targets</td>
</tr>
<tr>
<td>2 Gather data &amp; prepare requests through ERP</td>
<td>10 Review &amp; accept</td>
</tr>
<tr>
<td>7 Consolidate data and estimate salaries</td>
<td>Yes</td>
</tr>
<tr>
<td>8 Develop Estimated Budget</td>
<td>No</td>
</tr>
<tr>
<td>11 Amend Estimated Budget</td>
<td>Yes</td>
</tr>
<tr>
<td>12 Review if in Line with prioritization and targets</td>
<td>No</td>
</tr>
<tr>
<td>15 Finalize Allocation and determine reserves</td>
<td></td>
</tr>
<tr>
<td>16 Issue Final Budget</td>
<td></td>
</tr>
<tr>
<td>18 Finalize Budget</td>
<td></td>
</tr>
<tr>
<td><strong>Generation</strong></td>
<td></td>
</tr>
<tr>
<td>3 Estimate electricity &amp; water production, fuel and other requirements (excl. salaries) through ERP</td>
<td></td>
</tr>
<tr>
<td><strong>Distribution/Consumer services/others</strong></td>
<td></td>
</tr>
<tr>
<td>4 Estimate their requirements (excl. salaries) through ERP</td>
<td></td>
</tr>
<tr>
<td><strong>HR</strong></td>
<td></td>
</tr>
<tr>
<td>5 Estimate manpower changes &amp; other requirements (excl. salaries) through ERP</td>
<td>New/modified step</td>
</tr>
</tbody>
</table>

Source: PwC
... And the re-allocation process will be carried-out according to the same priorities and targets set by GECOL MD/OPEX Budget Committee

TO-BE OPEX (reallocation) process

* If the budget was to be transferred from the same class, the approval point will go up to the MD

Source: PwC
**Maintenance Process (Transmission)**

**Budget Process**

- **OPEX Budget**
- **CAPEX (Development) Budget**

**Invoicing/Collection Process**

**Appendix – Price Control Case Study**
The capital expenditure (CAPEX) budget covers GECOL capital expenditure for its projects (generation, transmission and distribution)

Characteristics of GECOL CAPEX budget process

<table>
<thead>
<tr>
<th>Scope</th>
<th>Initiation</th>
<th>Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Budget for expenses mainly related to upgrading and expanding the electricity infrastructure</td>
<td>Preparation of CAPEX budget is initiated by Ministry of Planning</td>
<td>CAPEX budgeting process runs from November till May each year</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Committee</th>
<th>Highest Authorities to Approve</th>
<th>Sources of Fund</th>
</tr>
</thead>
<tbody>
<tr>
<td>A budget committee comprised of all GECO general managers and chaired by the finance general manager oversee the budget cycle</td>
<td>Prime Minister (PM) and the Central Bank of Libya (CBL)</td>
<td>Government’s Budget</td>
</tr>
</tbody>
</table>

*Source: PwC analysis*
The CAPEX budget is managed today by the Contracts and Development Accounts general department in alignment with the Planning & Studies department.

Organization of key departments involved in the CAPEX budget

Legend
- General department
- Assistant
- Department / sub-department

Executive Manager

Contracts and Development Accounts

Contract & Dev. Accounts department and Planning & Studies department have the major role in CAPEX budget preparation.

Executive Manager

Planning & Studies

Administration

Development

LC’s and finance

Customs

Projects Accounting

Contracts

Information and archive

Strategic planning

Economical research and studies

Standards and new technology

Technical research and studies

Technical planning

Source: GECOL

Task C: Supporting Electricity Sector Reform

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The current CAPEX process tends to engage the main and secondary Cost Centres only in the preparation phase of the budget

Current CAPEX budget workflow process

Ministry of Planning prepared the next year budget template and send it to GECOL

Contracts & Dev. Accounts department distribute the template for
- The Studies and Planning department
- Generation, Transmission and Distribution

The Studies and Planning department send to the Contracts & Dev. Accounts department the next year budget of the planned projects

Contracts & Dev. Accounts department consolidates the budget against the template and send it to MD for discussions

The MD discuss/negotiate the budget with Ministry of Planning, CLB and Prime Minister

Gaps

- Requests, data gathering and consolidation are done manually
- GECOL has limited control over priorities as the final control is with the Government
- The CAPEX budget is on yearly bases which is short term compared to the types of projects included in the budget

Source: GECOL & PwC analysis
The current CAPEX process tends to engage the main and secondary Cost Centres only in the preparation phase of the budget

Despite of the need of major investments on the network, disbursement on GECOL CAPEX has been decreasing in the recent years due to the dependence on the Government budget and GECOL limited control over the budget.

Source: GECOL
The current CAPEX budget process runs yearly from Nov - Dec until March – April, led by the Contracts & Development Accounts department.

AS-IS CAPEX budget process (allocation phase)

Source: Contracts & Development GD PwC Interviews
Once allocated, a special project committee supervises the implementation of the project until it comes into service

AS-IS CAPEX budget process (completion phase)

1. Nominate project committee incl. project manager
2. Approves project committee
3. Issue LC for the EPC contractor
4. Collect All Project document
5. Follow up project implementation
6. Frequent progress reports to GM’s and MD*
7. Approves reports and issue payments instruction against contract milestones
8. Issue payment to the EPC contractor
9. Project/phase completed**
10. Nominate project receiving committee
11. Approves project receiving committee
12. Inspect project, documents, invoices and payments against the contract
13. Issue preliminary inspection report
14. Register assets
15. Issue final inspection report
16. Inspection ok
17. Approves inspection report
18. Review reports
19. Review Contractor invoice
20. Invoice is ok
21. Return invoice to contractor to amend
22. Invoice amended
23. Register payments
24. Register assets

* If the estimated budget of the project is exceeded due to irregularities or delays in implementation resulting from the contractor, the contractor bears responsibility for this (there are clear provisions in each contract approved for each project), or if for reasons common to the contractors may request increase of the target value to cover the phase not implemented and not Exceeds (15%) of the total value of the contract and is addressed to the regulatory authorities in particular through the Executive Director of the company

** Phases are only acceptable for Generation project and not transmission projects

Source: Contracts & Development GD PwC Interviews

Task C: Supporting Electricity Sector Reform

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**The key issue connected to GECOL CAPEX budget process is the limited control by GECOL over its amount, priorities and visibility**

**Issues related to the CAPEX (development) budget**

<table>
<thead>
<tr>
<th>No Control over Budget</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Budget allocated for “Development Projects” is outside GECOL’s control:</td>
<td></td>
</tr>
<tr>
<td>   – Depends largely on overall Government revenue</td>
<td></td>
</tr>
<tr>
<td>   – No match between approved 5-year Development plans and allocated Budget</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Limited Control over Priorities</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Budget allocation across projects changes to accommodate the priorities of the Government</td>
<td></td>
</tr>
<tr>
<td>• Government may request new or on-going projects to be accelerated forcing GECOL to delay planned or on-going projects by diverting funds, thereby contributing to aggravate the piecemeal development approach for the electricity sector…</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Short-term Visibility</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Budget is a yearly commitment when most electricity infrastructure projects require at least 2-3 years from contract signature to commissioning, which causes difficulties in estimating the budget</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Delays in finalizing the budget</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Budget initiation, starts in Nov - Dec which is already considered late in comparison to normal standards</td>
<td></td>
</tr>
<tr>
<td>• Not enough time to finalize the budget in time for the Government Budget preparation to consider its in its development Budget</td>
<td></td>
</tr>
</tbody>
</table>
The TO-BE CAPEX budget process should become a 3-5 years plan approved and committed by the Gov’t, with a revision carried-out on an annual basis

TO-BE CAPEX (development) budget

1. Ministry of Planning
   - 3-5 years Budget Template

2. Contracts & Dev. Accounts
   - Distribute Budget Template
   - Prepare draft CAPEX Budget against template
   - Amend draft CAPEX Budget

3. Planning & Studies
   - Provide status and next 3-5 years budget of on-going projects
   - Provide update 3-5 years budget requirements of planned projects not included in the previous budget (Gen, Trans & Dist) from (Master plan)

4. Projects (Gen, Tra and Dis)
   - Provide revised 3-5 years budget requirements of planned projects (Gen, Trans & Dist) from (Master plan)

5. Review & accept
   - Yes
   - No

6. Issue Final CAPEX Budget

7. Review & accept
   - Yes
   - No

8. Review
   - Yes
   - No

9. Distribute Final CAPEX Budget

10. End

New/modified step

Note: According to the future GECOL organization suggested with the current project, the functions of the Contracts & Development Accounts shall be taken by the newly formed AFS (and CFO) general department

Source: PwC

Task C: Supporting Electricity Sector Reform

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Final

14 December 2017

PwC

46
In the CAPEX budgeting process, GECOL should also include a Risk identification and management figure, with specific roles & responsibilities.

TO-BE CAPEX (development) budget

1. Nominate project committee incl. project manager
2. Approves project committee
3. Issue LC for the EPC contractor
4. Collect all project documents
5. Follow up project implementation
6. Frequent progress reports to GM’s and MD
7. Approves reports and issue payments instruction against contract milestones
8. Issue payment to the EPC contractor
9. Project/phase completed
10. Nominate project receiving committee
11. Approves project receiving committee
12. Inspect project, documents, invoices and payments against the contract
13. Issue preliminary inspection report
14. Register assets
15. Issue final inspection report
16. Inspection OK
17. Approves inspection report
18. Review reports
19. Invoice is OK
20. Return invoice to contractor to amend
21. Invoice amended
22. Follow dispute process as in the contract
23. Register payments
24. Register assets

* If the estimated budget of the project is exceeded due to irregularities or delays in implementation resulting from the contractor, the contractor bears responsibility for this (there are clear provisions in each contract approved for each project), or if for reasons common to the contractors may request increase of the target value to cover the phase not implemented and not Exceeds (15%) of the total value of the contract and is addressed to the regulatory authorities in particular through the Executive Director of the company. ** Phases are only acceptable for Generation project and not transmission projects.
The risk identification shall become an iterative process involving the project team and the other key stakeholders (i.e. MD / MP/CBL)

TO-BE CAPEX (development) budget

Source: PwC
Maintenance Process (Transmission)

Budget Process

OPEX Budget

CAPEX (Development) Budget

Invoicing/Collection Process

Appendix – Price Control Case Study
The consumers affairs department is the main GECOL department which manages the invoicing and collection processes

Organization of key department involved in invoicing/collection

Legend
- Assistant
- Department
- Sub-department

Source: GECOL
**Overview of GECOL meter reading and invoicing practices**

<table>
<thead>
<tr>
<th>Process</th>
<th>Process step/activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Meter Reading Process</strong></td>
<td><strong>Route plan</strong></td>
<td>• Metering department sets a route plan for all meter readers defining the areas that they need to visit and the time plan. The plan to be installed on a Hand Held Unit (HHU)</td>
</tr>
</tbody>
</table>
|                      | **Meter reading**                                                                    | • The meter readers will conduct a visit to all meters assigned to them and will get the reading of the meters on the handheld system  
• GECOL don’t estimate the consumption of any missing readings. |
|                      | **Export data**                                                                      | • Once back in the headquarters or branch, customer information will be uploaded to the billing system or the local database by the debt recovery division. |
|                      | **Generate invoice**                                                                  | • Billing department will prepare the bill and do bill verification (applicable tariff, unreasonable consumption, etc.)  
• Generate bill  
• Update AR |
| **Invoicing Process** | **Invoice delivery**                                                                 | • Meter readers will visit again the customers to deliver the invoice, also it can be delivered by email and soon by SMS |
|                      | **Time frame**                                                                       | • Quarterly for residential customers  
• Monthly for others (Commercial, Industrial, Agricultural) |

*Meter Inspection: Meters readers will report back if they visual any manipulation on the meter*
**Once GECOL has invoiced, customers have several payment methods available to pay their invoices**

### Overview of GECOL customers electricity bill payment methods

<table>
<thead>
<tr>
<th>Process</th>
<th>Process step/activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cash</td>
<td>Customers pay the invoice in Cash in GECOL branches</td>
</tr>
<tr>
<td>2</td>
<td>Bank Cheques</td>
<td>Customers pay the invoice by cheques in GECOL branches</td>
</tr>
<tr>
<td>3</td>
<td>Preauthorize bank</td>
<td>Invoice amount is deducted directly from customer bank account based on a prior arrangement</td>
</tr>
<tr>
<td>4</td>
<td>Preauthorize salary (GECOL employee)</td>
<td>Invoices of GECOL employees are deducted from their salaries</td>
</tr>
<tr>
<td>5</td>
<td>LYD pre-paid card</td>
<td>Customers pay the invoice through LYD prepaid card</td>
</tr>
<tr>
<td>6</td>
<td>Netting</td>
<td>Institutions invoices are settled (netted) through the general budget</td>
</tr>
</tbody>
</table>

---

Collection is an important process for GECOL and features downstream in GECOL value chain. It involves direct end customer interaction and impacts the revenue of GECOL.
Today meter inspections are uploaded in the reader HHU, who visits the customer, uploads the information back and provides it to the customer services department for invoicing.

**AS-IS metering & invoicing process**

1. **Consumer services/Commercial affairs**
   - Upload customer file on the reader HHU.

2. **Reader**
   - Visit the customer premises. As specified in the reader route.

3. **Consumer services/Commercial affairs**
   - Upload meter reading into the HHU.
   - Inspect meter condition.

4. **Consumer services/debt recovery division**
   - Upload customer information from the HHU to the billing system or the local database.

5. **Issue invoices**
   - Prepare the bill and do bill verification (applicable tariff, unreasonable consumption, etc.).

6. **Send SMS to customer**

7. **Distribute invoices to customers**
   - Route completed.

**End**

*Source: GECOL & PwC analysis*
Today GECOL customer voluntarily pays the invoice

AS-IS collection process*

1. Receive invoices
2. Payment by cash or bank cheque
3. Register payment on GECOL billing System

End

See slides 55-58

*) Not applicable for GECOL employees, customers with preauthorize bank arrangements and institutions with netting arrangements

Source: GECOL & PwC analysis
All bank payments are checked by the accountant, internal control and head of accounting department

Registration of collection through Bank-preauthorized on the billing system

1. Ensure that the bank deposit the amounts in the company’s account before the end of the next working day and extract the bank statements via e-banking to confirm receiving all the payments in a proper period.

2. Receive a list of collected amounts from customers service department, and a list of deposited amounts in the company’s bank account at the end of each day.

3. Verify the source of the received receipt by calling the bank and make sure of the Invoices, subscribers accounts, and notifying the internal control.

4. Payments Match?

   - No
   - Yes

5. Agree on the matching and validate the payments according to the authorities and duties matrix.

6. Send a summary of payment receipts and supporting documents to accounting department to record it in the general ledger.

7. Record Daily entries

8. Review and Post the recorded entries

End

Source: GECOL & PwC analysis

Task C: Supporting Electricity Sector Reform

PwC

Strictly private and confidential

Final

14 December 2017

55
Registration of collection through cash on the billing system

Collection through Cash Box

1. Ensure that the bank deposit the amounts in the company’s account before the end of the next working day and extract the bank statements via e-banking to confirm receiving all the payments in a proper time.

2. Receive a list of collected amounts from customers service department, and a list of deposited amounts in the company’s bank account at the end of each day.

3. Verify and match the payments receipts prepared by cash box/boxes and the deposited amounts in bank.

4. Payments match?
   - No
   - Yes

5. Agree on the matching and validate the payments according to the authorities and duties matrix.

6. Send a summary of payment receipts and the supporting documents to the accounting department to record it in the general ledger.

7. Record Daily entries

8. Review and Post the recorded entries

9. Check the differences (decrease/increase), and formalize an investigation Committee according to the authorities and duties matrix.

End
Ensure depositing the 
cheques before the end 
of each next working day 
and issue the bank 
statements on daily basis 
to ensure that the 
cheques are cashed.

Yes

No

Received 
checks?

Send a summary of payment 
receipts and the supporting 
documents to the accounting 
department to record it in the 
general ledger

Yes

Issue a new invoice

No

Receive a list of collected 
amounts from customers 
service department and a 
list of deposited amounts in 
the company’s bank account 
at the end of each day

Check the verify payment 
receipts and invoices

Payments 
match?

Agree on the matching and validate the payments according to the authorities and duties matrix

Yes

No

End

Record Daily entries

Review and Post the recorded entries

Yes

No

Returned checks?

Issue a new invoice

Source: GECOL & PwC analysis
Collection through Pre-paid card

1. Ensure direct depositing of amount and issue the bank statements through the web on daily basis to make sure that all payments are received (payment of the instalment).

2. Verify receiving a list of subscribers who paid their invoices by (prepaid) from the customers service department and list of deposited amount in the company’s account.

3. Check the verify payment receipts and invoices.

4. Payments match?
   - No
   - Yes

5. Agree on the matching and validate the payments according to the authorities and duties matrix.

6. Send a summary of payment receipts and the supporting documents to the accounting department to record it in the general ledger.

7. Record Daily entries

8. Review and Post the recorded entries

End

Source: GECOL & PwC analysis
A series of issues related to GECOL invoicing and collection process were identified, some of which not directly related to the strict processes in place

<table>
<thead>
<tr>
<th>Issues related to the invoicing and collection processes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lack of installation</strong>*</td>
</tr>
<tr>
<td><strong>Disconnection Policy</strong>*</td>
</tr>
<tr>
<td><strong>Penalties/Incentives</strong></td>
</tr>
<tr>
<td><strong>Billing System</strong>*</td>
</tr>
<tr>
<td><strong>No. of visits</strong></td>
</tr>
<tr>
<td><strong>Manual reading</strong></td>
</tr>
<tr>
<td><strong>Missing readings</strong></td>
</tr>
<tr>
<td><strong>Traditional metering process</strong></td>
</tr>
<tr>
<td><strong>Invoicing timeframe</strong></td>
</tr>
<tr>
<td><strong>Audit function</strong></td>
</tr>
</tbody>
</table>
The key change to the TO-BE process is to use estimates in case meters are not accessible as well as the introduction of penalties for late payments.

TO-BE metering and invoicing processes

1. Update customer master file to include all GECOL customers. Upload customer file on the reader HHU.
2. Visit the customer premises as specified in the reader route.
3. Customer meter is accessible.
4. Estimate reading based on formulas installed in HHU.
5. Upload meter reading into the HHU. Inspect meter condition.
6. Route completed.
7. Upload customer information from the HHU to the billing system or the local database.
8. Issue invoices. Prepare the bill and do bill verification (applicable tariff, unreasonable consumption, etc.). Calculate late penalty.
9. Send SMS to customer.
10. Distribute invoices to customers.

End

Source: PwC
GECOL shall also consider issuing monthly (estimated) invoices to its residential customers, while continuing to carry-out readings on a quarterly basis

TO-BE metering and invoicing processes

1. New/modified step: Estimate customer monthly consumption

2. Issue invoices, prepare the bill and do bill verification (applicable tariff, unreasonable consumption, etc.)

3. Send SMS to customer

4. Distribute invoices to customers

End

Source: PwC
**GECOL to consider introducing multiple policies to enhance the collection process**

**Policies to enhance collection processes**

- **Collect and maintain customer data file**
  - GECOL to update its customer file to include all customers connected to the grid

- **Introduce of smart metering system**
  - GECOL to start implementing smart meters on large consuming customers
  - GECOL to create sub-department that follows and monitors smart meters and payments from large customers

- **Introduce disconnection policy**
  - Disconnection policy to disconnect from non-paying customers based on a specific criteria such as number of unpaid invoices

- **Make it easy to pay**
  - Introducing a variety of payment channels such as engaging third party merchant processors.
  - Exclusively use HHUs by all meter readers and integrate them with billing system

- **Liaise with the Government**
  - The Government shall support GECOL in all its collection efforts. Therefore the GECOL shall publish its collection policy including fees, timelines, and disconnection.

*Source: PwC*
GECOL to send reminders then disconnect electricity if customer did not pay in accordance with the disconnection policy

To-Be collection process*

1. Receive invoices then reminder
2. Payment by cash or bank cheque
3. Register payment on GECOL billing System

*) Not applicable for GECOL employees, customers with preauthorize bank arrangements and institutions with netting arrangements

Source: PwC
Contents

Maintenance Process (Transmission)

Budget Process

  OPEX Budget

  CAPEX (Development) Budget

Invoicing/Collection Process

Appendix – Price Control Case Study
Authority for Electricity Regulation, Oman sets a 3 years price control (yearly budget limit) for all licensees that cover all regulated activities.

Price Control is developed to assist and encourage licensees to address a number of key challenges:

**Key Challenge**

- Efficiently meeting the rapid growth in demand
- Development and retention of appropriate technical capabilities
- Improve meter reading, billing and collection
- Deployment of renewable energy sources
- Maintaining cyber security

**Response to the challenge through Price Control**

- Licensee to develop and operate its business to meet the demand efficiently and effectively
- Train and retain staff with appropriate qualifications and skills to enable the Licensees to undertake their Licensed activities
- Improvements to the performance in this area
- Ensuring that Licensee has appropriate organizational arrangements to administer the deployment of renewable energy
- Ensuring critical electrical infrastructure is properly protected against threats from cyber-attacks

The Price Control is developed based on best practice including transparency and consultation.

*Source: PwC*
And the Authority sets main criteria while deciding on the OPEX budget as a response for the challenges

<table>
<thead>
<tr>
<th>Cost</th>
<th>Description</th>
<th>Criteria for setting target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Cost</td>
<td>Direct Costs are the costs of operating and maintaining the Production and Networks Businesses.</td>
<td>• Benchmarking of costs per kilometer of network length. Or</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Benchmarking Direct Cost per Customer Accounts (CA)</td>
</tr>
<tr>
<td>Staff</td>
<td>Staff salaries</td>
<td>• Benchmarking of average salaries and the inclusion of more staff in the customer services to increase billing and collection efficiency</td>
</tr>
<tr>
<td>Other G&amp;A</td>
<td>Costs incurred in relation to a number of ancillary services such as insurance, accounting, transportation, travel, communication and others.</td>
<td>• Comparing the growth rate in Other G&amp;A expenses to the growth rates in CAs and FTEs</td>
</tr>
<tr>
<td>Consultancy</td>
<td>The costs associated with engaging external expertise which can be general or technical in nature.</td>
<td>• Business as usual, or</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Based on justified technical, managerial needs.</td>
</tr>
<tr>
<td>Rent</td>
<td>The costs related to the rent of space.</td>
<td>• The decision to own or rent space is therefore a significant factor in influencing the amount of rent expenditure that a Licensee incurs.</td>
</tr>
<tr>
<td>Training</td>
<td>The costs related to the training of staff.</td>
<td>• Training on specific development matters that are relevant to the business and will enable Licensee to meet the challenges efficiently.</td>
</tr>
<tr>
<td>Meter Reading, Billing &amp; Collection</td>
<td>The costs related to.</td>
<td>• Implementation of remote meter reading.</td>
</tr>
<tr>
<td>Bad debt</td>
<td>Allowance for bad debts.</td>
<td>• Comparison between outsourcing the process or to be in-house</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The low allowance would strongly incentivize the Licensee to collect its payments efficiently.</td>
</tr>
</tbody>
</table>

The Authority benchmark the cost items between the different Licensees

Note: Fuel cost is pass through

Source: PwC
The price controls are adjusted each year by a factor of CPI – X, where X is efficiency factor

Improving Performance

01 X- Factor

The Authority has determined that an X factor of 2% p.a. over the course of the price control period will apply across all RAEC businesses

The Authority has retained these assumptions despite Licensees’ arguments for a lower X-factor in their response

The Authority considers that the X-factor of 2% p.a. do not represent an unduly onerous efficiency challenge in light of the expected high growth over the forthcoming period and the outturn efficiencies achieved by utilities in other countries

02 KPI’s

Title goes here
Text goes here goes here goes here goes here goes here goes here.

The Authority decided that no financial rewards or penalties will be attached to performance during the current price control, but the Authority may look to introduce such arrangements at the next price control review once more robust data becomes available.
The Authority runs the process in a transparent way and issue the final budget for each Licensee including the consultation results.

Workflow Process

A. Authority proposes the budget for each Licensee based on benchmarking between different Licensees and criteria.

B. Each Licensee response and comments on the Authority budget proposal.

C. Authority discuss with each Licensee his response and issue the final budget.

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authority first proposal</td>
<td>xxxx</td>
<td>xxxx</td>
<td>xxxx</td>
<td>xxxx</td>
</tr>
<tr>
<td>Licensee response</td>
<td>xxxx</td>
<td>xxxx</td>
<td>xxxx</td>
<td>xxxx</td>
</tr>
<tr>
<td>Authority final decision</td>
<td>xxxx</td>
<td>xxxx</td>
<td>xxxx</td>
<td>xxxx</td>
</tr>
</tbody>
</table>

The Final Price Control Document is a comprehensive that includes the final Price Control for the Licensee and a comparison between the Authority decision and the Licensee response with full explanation.

Source: PwC