R&D Effectiveness Metrics
Key Performance Indicators at eni

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OUTLINES

- Eni R&D structure e costs
- Background e Project targets
- Challenges and Dilemma
- Eni approach
- Eni set of KPI
- Benchmarking
- Concluding remarks
eni’s R&D Spending in 2009

- In 2009 Eni invested approximately €207 million in research and development activities

- The greatest effort was dedicated to E&P technologies (70 M€), followed by eni-Corporate spending (50 M€) and R&M projects (37 M€), whilst G&P spent only 2 M€.
Overall Targets of the KPIs system

In 2009 eni’s top management decided to set up a KPI system for the measurement and monitoring of eni’s R&D activities;

Define a methodology to measure the value created by R&D activities which should be able to:

- Capture not only merely economic value, but also intangible assets;
- Measure the efficiency and effectiveness of the ongoing projects in the R&D portfolio, focusing on the most relevant ones;
- Assure transparent and traceable estimates, based on actual data;
- Assess regularly the coherence between eni strategy and long-term projects;
- Support the evaluation of different kind of projects and results: incremental vs. breakthrough, core business technologies vs. emerging ones;
- Evaluate at least on a yearly basis the results

Support the planning and leading role of Corporate on the R&D activities.

Challenges & Dilemma...(1 of 3)

- Concerns about the possibility of capturing R&D value by means of a KPIs system, as most of the value is embedded in operations or become evident later;
- The need of a strong support by marketing & sales units and/or operations units to assess economic value generated by R&D projects;
- Lack of a market consolidated reference as few energy companies are already applying a KPIs structured approach;
- Many KPIs widely used refer mainly to qualitative parameters such as “researchers headcount”, “projects in the pipe”, “balance between incremental and breakthrough projects”.

Challenges & Dilemma...(2 of 3)

**E&P business unit**
- lack of end user market and of customers’ feed-back;
- innovative technologies are often exploited by joint-ventures with other Oil Companies or with National Oil Company;
- in a resources constrained environment, the evaluation of benefits could be time consuming.

**G&P business unit**
- technology innovation is not a powerful tool to gather a competitive advantage;
- strong limitation of international rules on pipelines and in general on materials;
- need of an international qualification before the launch of new technologies or the use of advanced materials in the market.

Challenges & Dilemma...(3 of 3)

**Refining & Marketing business unit**
- innovative processes are mainly bought from technology providers;
- innovative technologies can be hardly applied in equity refineries for internal valorization and a licensing-out strategy may be needed.

**Polimeri Europa, petrochemical company**
- R&D activities are market driven;
- environmental concerns are a key driving factor;
- Technology is needed to strengthen competitive advantages towards Middle-East low-cost newcomers.

**eni Corporate long term renewable R&D projects**
- out from current core business activities;
- need to monitor and evaluate the on-going advancements of long-term projects and assess the future business opportunities.
eni’s way

- Business units have been brought onboard from the very beginning to raise commitment of all actors and strengthen acceptance;
- Four key performance areas have been selected: tangible & intangible value, efficiency, effectiveness and strategic coherence;
- A Working Group, with representatives from Corporate and Business Units, was appointed at the end of 2009 to define a first set of KPIs;
- A significant but manageable number of KPIs have been identified for each of the four key areas;
- KPIs were duly analyzed during several meeting in 2010
- A round of testing was made on 2009 R&D results and was used to validate the KPIs usefulness, measurability, traceability and share-ability with the involved business lines;
- The agreed methodology and set of indicators were approved by top management in October 2010

eni’s Set of KPIs: Value Generated

<table>
<thead>
<tr>
<th>METRICS</th>
<th>KEY PERFORMANCE INDICATORS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Value Generated</strong></td>
<td>Economic Value (Cost Savings/ Revenues) generated by deployment of R&amp;D technologies;</td>
</tr>
<tr>
<td><strong>Tangible</strong></td>
<td>N° of Patent Applications; N° of Patent Applications/R&amp;D spending;</td>
</tr>
<tr>
<td><strong>Intangible (know-how)</strong></td>
<td>N° of Publications in international journals; Yearly Technologies/Services transferred to Business Units from R&amp;D;</td>
</tr>
</tbody>
</table>
Economic Benefits are generated by closed and on-going projects

Tangible benefits: business value drivers

Economic benefits are measured by considering the results of technologies adopted by business units, licensed to third parties or underpinning new businesses lines;

- **E&P technologies**
  - Capex Savings
  - Opex Savings
  - Additional Oil&Gas Production;
  - Additional NPV
  - Additional Booked Reserves

- **R&M technologies**
  - Innovative Products Contribution Margin
  - Innovative Processes Operating Margin
  - Products, Process, Catalysts Licenses Royalties

- **Petrochemical technologies**
  - Innovative Products Contribution Margin
  - Innovative Processes Operating Margin
  - Products, Process, Catalysts Licenses Royalties

- **Renewable/early stage technologies**
  - NPV of new businesses launched within the Strategic Plan Horizon

Actual results are used to measure economic benefits, with the exception of NPV which is used for capturing value of technologies displaying a long application cycle (typically upstream and renewable).
Intangible Value

Intangible value is hard to measure but is probably the biggest single contribution to the value created by R&D in each company;

Without aiming at capturing the overall intangible value generated, a pragmatic approach has been chosen by focusing on KPIs easy to measure and clear to understand;

Intangible value is measured through a number of indicators as follows:

- **number of patent applications** – a measure of inventive capability;
- **number of patent applications referred to the overall spending in R&D** - a measure of inventive productivity;
- **number of publications in international journals** - recognition of eni’s R&D achievements at an international level;
- **R&D Technologies transferred to or adopted by Business Units each year** - a measure of R&D capability to respond to business needs.

### eni’s Set of KPI: Portfolio and Projects Quality Measurement

<table>
<thead>
<tr>
<th>METRICS</th>
<th>KEY PERFORMANCE INDICATORS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2. Portfolio Efficiency and Effectiveness</strong></td>
<td>N° of Technology Applications on the field; Milestones Met; Milestone Delayed; Milestone Failed; Released vs. Planned Deliverables; Portfolio Yearly Spending vs Budget.</td>
</tr>
<tr>
<td><strong>3. Project Efficiency and Effectiveness</strong></td>
<td>Milestones Met; Milestone Delayed; Milestone Failed; Released vs. Planned Deliverables; Project Yearly Spending vs Budget.</td>
</tr>
<tr>
<td><strong>4. Strategic Alignment</strong></td>
<td>Spending of the projects in line with strategy vs. total projects spending.</td>
</tr>
</tbody>
</table>
Tangible Value – Capex Savings: A Sample From The Handbook

What It Measures
It quantifies savings on capital costs (capex) achieved by applying the innovative technology instead of the best alternative technology available on the shelf.

How It Measures
The value of each contribution is based on the comparison between the actual investment costs incurred using the new technology and the cost of applying the best alternative technology estimated by the technical functions / business lines responsible for the asset. Data is shared with the E & P Technology Planning Function.

Past Performance

<table>
<thead>
<tr>
<th>Technology</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intelligent Well Completion</td>
<td>Savings from N. Bardawil project development</td>
</tr>
<tr>
<td>Extreme Lean Profile</td>
<td>Evaluation of 5 wells in Val d’Agri. X-LP costs, times and wastes are inferior than conventional architectures</td>
</tr>
<tr>
<td>Dual Casing Running</td>
<td>2 “working day/well” saved to drill each of the 4 wells in Congo and Angola</td>
</tr>
<tr>
<td>Carbon Steel Lined Pipeline</td>
<td>Materials for 60 KM M’Boundi pipeline – Longest swage lining worldwide</td>
</tr>
<tr>
<td>Multiphase Meters</td>
<td>Saving generated from the use of meter VEGA technology</td>
</tr>
<tr>
<td>Coil Shooting</td>
<td>First worldwide Multi-Streamer application at industrial gate, used for the Tulip (Indonesia) discovery appraisal.</td>
</tr>
<tr>
<td>E-Drilling</td>
<td>14 wells monitored: savings generated by actions on 3 wells</td>
</tr>
<tr>
<td>Mini – DST Design Charts</td>
<td>A particular design and an optimal interpretation of 3 mini DST on the Aster 5 well has generated savings compared to the conventional well-test</td>
</tr>
</tbody>
</table>

Benchmarking eni’s KPI vs. most used KPIs in R&D

Note: in yellow eni’s KPI.

Source: Current State of R&D Metrics Complete Findings
24 March 2010, Research & Technology Executive Council® of the Finance and Strategy Practice
## eni’s vs. Most Used KPI (Energy Sector)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Strategic Alignment</td>
</tr>
<tr>
<td>2</td>
<td>Total Patents Filed/Pending/Awarded</td>
</tr>
<tr>
<td>3</td>
<td>Variance from Budget</td>
</tr>
<tr>
<td>4</td>
<td>Total R&amp;D Headcount</td>
</tr>
<tr>
<td>5</td>
<td>Number of Papers Published</td>
</tr>
<tr>
<td>6</td>
<td>Percentage of Active Projects Involving External Partners</td>
</tr>
<tr>
<td>7</td>
<td>Deviation from Schedule</td>
</tr>
<tr>
<td>8</td>
<td>Number of Ideas or Concepts in the Pipeline</td>
</tr>
<tr>
<td>9</td>
<td>R&amp;D Spending as a Percentage of Sales</td>
</tr>
<tr>
<td>10</td>
<td>Net Present Value of Product</td>
</tr>
</tbody>
</table>

Note: in yellow eni’s KPI.

Source: **Current State of R&D Metrics** Complete Findings  
24 March 2010, Research & Technology Executive Council® of the Finance and Strategy Practice

## eni’s vs. Most Used KPI (Companies Best in Class)

**Cost Focused Metrics**

- **Total R&D Headcount**
- **Cost Savings Attributable to R&D**
- **Variance from Budget**
- **Deviation from Schedule**
- **N° of Projects in Active Development (active Backlog)**

Note: in yellow eni’s KPI

Source: **Current State of R&D Metrics** Complete Findings  
24 March 2010, Research & Technology Executive Council® of the Finance and Strategy Practice
enі’s vs. Most Used KPI (Companies Best in Class)

Growth Focused Metrics

- R&D spending as a Percentage of Sales
- % of Portfolio in Core and Growth Projects
- Current Year Percentage of Sales from New Products/Services
- Net Present Value of Entire New Product/Service Portfolio
- Number of Products Released in the Last N Years

Note: in yellow enі’s KPI

Source: Current State of R&D Metrics Complete Findings
24 March 2010, Research & Technology Executive Council® of the Finance and Strategy Practice

Concluding Remarks

- The Working Group has concluded its activities in December 2010 by:
  - Identifying a set of KPI to be used for monitoring R&D activities;
  - Issuing an operative manual to make the measurement methodology shared, traceable and repeatable yearly;
- In addition a benchmarking activity has been carried out with the help of an external consultant. It confirms the robustness of enі’s KPI set and suggests some areas for of further improvements;
- KPIs methodology implementation:
  - supports teams dealing with risk of selecting and applying new technologies;
  - increases motivation and business focus of researchers;
  - makes aware all the company functions about challenges and opportunities of R&D sector
  - support top management in defining R&D strategy and in leading the R&D activities towards long term business targets
- From 2011, KPIs have been introduced at project level in the technology planning phase for monitoring the R&D portfolio,
- 2009 e 2010 results confirm a large return from R&D projects.
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Thanks for your attention