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</table>

© Albanian Power Corporation, 2015; Prepared by: Planning and Strategic Management Division, KESH
The Albanian Power Corporation (KESH) is the public producer and, at the same time, the largest electricity producer in Albania. KESH operates the most important electricity generating plants in the country. These assets consist of the Drin River Cascade hydropower plants (Fierza HPP, Komani HPP and Vau i Dejës HPP), with an installed power capacity of 1,350 MW, and the Vlora TPP, with an installed power capacity of 98 MW. The cascade, built on the Drin River, is the largest in the Balkans, by installed capacity, as well as by the size of the hydropower plants.

By operating 79% of the generation capacity in the country, KESH supplies about 70-75% of the customers’ demand for electricity, provides the energy needed to cover the losses in the transmission grid, as well as guarantees the security of the Albanian energy system through balancing energy and auxiliary services.

KESH is also responsible for the administration, the proper operation as well as for guaranteeing the technical and operational safety of the power plants it operates.

KESH is not only one of the most important producers of electricity from hydro sources in the region, but is considered to have a regional impact, in terms of the security of hydro plants.

**Total Assets** - 184 billion Lek  
**Average annual power production** - 3,851 GWh  
**Average annual revenues** - 20 billion Lek  
**Average staff number** - 994 employees

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**Institutional Evolution of KESH sh.a.**

The KESH company, in response to the dynamics of developing the national legal framework, which aims the harmonization energy legislation with EU, has undergone a series of fundamental transformations since 2000, by converting, from a vertically integrated company (beginning in 1957), to a company that presently focuses on the power generation and trade.

- **1957**: The General Directorate of Electrical Power Stations is established (DPCE) as a State Enterprise.
- **1992**: DPCE transforms from a State Enterprise into a Business Organization - the Albanian Power Company (KESH).
- **1995**: KESH sh.a. company receives the status of joint stock company with shares owned 100% by the Albanian State.
- **2001**: KESH is deprived from transmission functions, it performed so far, and the Transmission System Operator (OST) is established.
- **2004**: KESH is deprived from the functions of a retail distributor and supplier and the Distribution System Operator (OSSH) is established.
- **2007**: KESH sh.a. operates generation, supplies the public and trades electricity wholesale. The Albanian state owns 100% of the Company’s shares.
- **2015**: KESH is “relieved” from Wholesale Public Supplier function and focuses on the electricity generation and trade of Electricity, as well as in maintaining and developing generation assets.
- **2016**: Enters into force the current statute of KESH, which in compliance with EU legislation for the privatization of non-natural monopolies, provided for the separation of basic functions, by taking away the Transmission and Distribution and leaving only the Energy Production.
Meeting the domestic demand for electricity at the affordable and competitive costs, through the effective use of existing water resources and the development of new ones.

Ensuring the longevity and safety of power plants, through proper management, maintenance and their technological upgrading.

Minimize the environmental impacts and enhance the social responsibility of the company.

The Albanian Power Corporation (KESH), anticipating the changes to the Energy Sector, the energy market liberalization and the regional integration of the energy systems, considers it necessary to modernize and increase the technical and management capacities of the company. In this context, KESH is undergoing an internal reform process, which will prepare KESH to function successfully in the future, in a more open and competitive environment.

Some of the main aspects of the reform process are:

Improving work effectiveness and enhancing resources management.

The Energy Sector Reforms envisage KESH to focus on the energy generation and trade operations as well as to contribute in the preservation of the Electro-Energetic System safety parameter. These changes pose the need but also create the appropriate incentive for KESH, like the other operators in the power market, to increase its performance indicators, in order to ensure effective implementation of tasks and accomplishment of objectives. Annual financial and economic programs and the medium-term program (2015-2020) were compiled harmonizing the objectives with the effective use of the company’s financial, technical and human resources.

Proactive management of the technical, operational and financial risks.

In order to manage and maintain the risk at a reasonable level, KESH has set up and is successfully implementing a new system of internal financial controls, as a guarantee for the effective attainment of the company’s objectives. Meanwhile, we are in the process of reassessing the regulations and the technical and operational procedures, in order to adapt them to the technological developments and changes, for the proactive management of the technical and operational risks.

Capacity building and workforce qualification.

KESH should be capacitated to implement all the expected changes with high standards and professional liability. For this reason, we have undertaken a series of organizational changes and took a commitment to the professional development, enhancing of the workforces’ performance, in order to bring the objectives of the company closer to employees at all levels of management, incorporating and factorizing each employee. We believe that this approach will increase the self-confidence of being part of the KESH company, as a form of commitment for the future.

Changing the way of thinking and adopting new working methods requires time, but will serve achieving the objectives and the modernization of the company.

Adoption of new technologies to increase effectiveness and safety.

KESH’s generation assets, built decades ago, require the implementation of new technologies for their proper operation, control and monitoring. This will increase the efficiency, lifespan and safety parameters for these assets, improving the work conditions and minimizing the environmental impact at the same time. For these reasons, we are committed to introduce new technologies, as a key objective, in the ongoing maintenance, rehabilitation and in new foreseen investments. KESH considers that risks management and performance increase require agility in decision-making and a proactive approach in managing unforeseen situations. Therefore, KESH has begun and will continue its ambitious programme to implement IT-based information systems for the management of technical and administrative processes, for automation of information exchange and the establishment of platforms for the operational modeling of business processes, in order to adapt to meteorological and electricity situations that may arise.
Power Production

### Water Inflow and Production

<table>
<thead>
<tr>
<th>Year</th>
<th>2015</th>
<th>2014</th>
<th>2013</th>
<th>Multiyear Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Inflow in Fierza (m³/s)</td>
<td>176</td>
<td>143</td>
<td>241</td>
<td>175</td>
</tr>
<tr>
<td>In respect to the 25-years Average (%)</td>
<td>100.6</td>
<td>81.7</td>
<td>137.7</td>
<td>100.0</td>
</tr>
<tr>
<td>Power Production of the Cascade (Gwh)</td>
<td>4,496</td>
<td>3,414</td>
<td>5,815</td>
<td>3,851</td>
</tr>
<tr>
<td>In respect to the 25-years Average (%)</td>
<td>116.7</td>
<td>88.7</td>
<td>151.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

### Generation Effectivity

<table>
<thead>
<tr>
<th>Year</th>
<th>2015</th>
<th>2014</th>
<th>2013</th>
<th>Multiyear Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fierza</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water Consumption (m³/kWh)</td>
<td>3.66</td>
<td>3.79</td>
<td>3.73</td>
<td>3.87</td>
</tr>
<tr>
<td>Average Load of the Generators (%)</td>
<td>90.0</td>
<td>90.0</td>
<td>89.0</td>
<td></td>
</tr>
<tr>
<td>Komani</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water Consumption (m³/kWh)</td>
<td>4.15</td>
<td>4.16</td>
<td>4.19</td>
<td>4.22</td>
</tr>
<tr>
<td>Average Load of the Generators (%)</td>
<td>82.0</td>
<td>78.0</td>
<td>75.0</td>
<td></td>
</tr>
<tr>
<td>V. Dejës</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water Consumption (m³/kWh)</td>
<td>8.51</td>
<td>8.48</td>
<td>8.48</td>
<td>8.41</td>
</tr>
<tr>
<td>Average Load of the Generators (%)</td>
<td>84.0</td>
<td>84.6</td>
<td>85.0</td>
<td></td>
</tr>
</tbody>
</table>

Note: The deterioration of the indicators in HEC Vau i Dejës is due to the working regime at HPP Ashta-1

### Operating Level and Inflow at Fierza Lake during 2015

![Graph showing the average operating level and inflow at Fierza Lake during 2015](image)

### Inflow Management during the Rainy Season

<table>
<thead>
<tr>
<th>Year</th>
<th>Average (2001-2015)</th>
<th>2015 Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Water Inflow during January-May (m³/sek)</td>
<td>428</td>
<td>430</td>
</tr>
<tr>
<td>Power Production of the Cascade during January-May (GWh)</td>
<td>2,491</td>
<td>2,078</td>
</tr>
<tr>
<td>Water Discharge during January-May (million m³)</td>
<td>567</td>
<td>1,421</td>
</tr>
</tbody>
</table>

### Operating Level of Fierza Lake on June the 1st (m.a.s.l.)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>291.0</td>
<td>290.5</td>
<td>290.5</td>
</tr>
<tr>
<td>295.0</td>
<td>296.1</td>
<td>296.1</td>
</tr>
<tr>
<td>295.0</td>
<td>296.1</td>
<td>296.1</td>
</tr>
<tr>
<td>294.5</td>
<td>295.0</td>
<td>295.0</td>
</tr>
<tr>
<td>290.5</td>
<td>291.0</td>
<td>291.0</td>
</tr>
<tr>
<td>289.1</td>
<td>290.0</td>
<td>290.0</td>
</tr>
<tr>
<td>286.6</td>
<td>288.0</td>
<td>288.0</td>
</tr>
<tr>
<td>284.0</td>
<td>286.0</td>
<td>286.0</td>
</tr>
<tr>
<td>282.0</td>
<td>284.0</td>
<td>284.0</td>
</tr>
</tbody>
</table>

### KESH Activities

- Has produced 2,491 GWh energy, or 20% more than the seasonal production average, or 2,078.1 GWh.
- Has discharged 567 mn. m³ of water without generation, or 40% less than the seasonal discharge average of 1.420 mn. m³.
- Started 1 June 2015 with the Fierza’s reservoir operating level at about 5 m higher than the multiyear average of the reservoir level on this date.

During the rainy season, January-May 2015, having almost the same water inflow as the 15-year average for the same period, KESH:
Electro-mechanical Maintenance of the Units

<table>
<thead>
<tr>
<th>Maintenance Indicators</th>
<th>2015</th>
<th>2014</th>
<th>2013</th>
<th>Multiyear Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Production (Gwh)</td>
<td>4,496</td>
<td>3,414</td>
<td>5,815</td>
<td>3,851</td>
</tr>
<tr>
<td>Units working hours (OP)</td>
<td>53,249</td>
<td>43,433</td>
<td>71,648</td>
<td>55,603</td>
</tr>
<tr>
<td>In respect to the 10-years Average (%)</td>
<td>95.8%</td>
<td>78.1%</td>
<td>128.8%</td>
<td>100%</td>
</tr>
<tr>
<td>Default hours of the Units (OA)</td>
<td>60</td>
<td>155</td>
<td>184</td>
<td>840</td>
</tr>
<tr>
<td>In respect to the 10-years Average (%)</td>
<td>7.2%</td>
<td>18.5%</td>
<td>21.9%</td>
<td>100%</td>
</tr>
<tr>
<td>Availability Index (OP/(OP+OA)%</td>
<td>99.88%</td>
<td>99.64%</td>
<td>99.74%</td>
<td>98.51%</td>
</tr>
<tr>
<td>No. of Default Cases per year (RAD)</td>
<td>44</td>
<td>71</td>
<td>136</td>
<td>99</td>
</tr>
<tr>
<td>Working hrs. between Defaults (OP/RAD)</td>
<td>1,210</td>
<td>612</td>
<td>527</td>
<td>562</td>
</tr>
</tbody>
</table>

Number of Default Cases per year

![Graph showing the number of default cases per year from 2013 to 2015 with a downward trend from 136 to 44 cases.]

Default hours of the Units per year

![Graph showing the default hours of the units per year from 2013 to 2015 with a downward trend from 840 to 60 hours.]

Availability Index of the Units

![Graph showing the availability index of the units per year from 2013 to 2015 with an upward trend from 98.51% to 99.88%.]

Working Hours between Defaults

![Graph showing the working hours between defaults per year from 2013 to 2015 with an upward trend from 527 to 1,210 hours.]

Maintenance plan implementation (capital overhauls, medium overhauls and prophylactic overhauls) for hydro-generators, auxiliary equipment and power plants, aimed at maintaining the technical parameters of exploitation, in accordance with security standards and operating manuals and their effectiveness.

The proper care taken, maintenance service quality and positive impact of the investments, made possible the following results:

- **Units’ Availability Index in 2015** was at the rate of 99.98% or 1.39% higher than the 10-year average and 0.24% higher than 2014.
- The indicator of **units working hours in defaults (unplanned disruptions)** appears to be at 7.2% of the 10-year average and 60% lower than in 2014.
- The **default cases occurrence (number of outages)** was about 38% lower compared with 2014 and 55.6% lower than the 10-year average.
- The **working hours between defects indicator (continuation of work without interruptions)** has increased year by year and in 2015 was 115.3% higher than the 10-year average.
KESH Activities

Power Transactions

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average Price of Imports (€/MWh)</strong></td>
<td>72.00</td>
<td>64.45</td>
<td>54.50</td>
<td>51.61</td>
<td>46.36</td>
</tr>
<tr>
<td><strong>HUPX Exchange Average Price (EUR/MWh)</strong></td>
<td>55.81</td>
<td>51.49</td>
<td>42.33</td>
<td>40.48</td>
<td>40.59</td>
</tr>
<tr>
<td><strong>Average Price of Exports (Eur/MWh)</strong></td>
<td>39.98</td>
<td>47.28</td>
<td>28.22</td>
<td>43.73</td>
<td>31.87</td>
</tr>
</tbody>
</table>

Note: The average transaction prices were taken as a base reference for the "Band" profile.

**PRICE PERFORMANCE OF ENERGY TRANSACTIONS**

Thanks to the continuous improvement of commercial planning and negotiation skills, year after year, KESH has made possible the purchase of electricity at imports prices that are approaching more and more the average market price.

Generally, KESH sells the electricity in the deregulated market (export) in emergency situations, during intense rains that bring large inflows, which can not be accumulated in the reservoirs. In these conditions, KESH negotiating abilities for the price are limited, conditioned by the lack of alternatives and the lack of choice, which is reflected in lower export prices.

During 2014, as a result of frequent rainfalls, of low intensity and distributed throughout the year, KESH was able to negotiate favorable prices for power exports and sold it at an average price higher than the stock market's average price for the corresponding period.

Economic optimization enables KESH to secure additional income, as a result of the difference between the sales' and purchases' prices of electricity, without affecting the overall energy reserve.

<table>
<thead>
<tr>
<th>Transaction Portfolio Optimization</th>
<th>Year 2015</th>
<th>Year 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Amount (MWh)</td>
<td>Average Price (€/MWh)</td>
</tr>
<tr>
<td>Purchases of Power</td>
<td>19,614</td>
<td>31.39</td>
</tr>
<tr>
<td>Power Sales</td>
<td>19,614</td>
<td>44.68</td>
</tr>
<tr>
<td>Financial Outcome (income from transactions)</td>
<td>+303,010</td>
<td></td>
</tr>
</tbody>
</table>
Performance Indicators

Financial and Economic Indicators

<table>
<thead>
<tr>
<th>Economic Performance through the years</th>
<th>2015 (operative datas)</th>
<th>2014</th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Production (GWh)</td>
<td>4,496</td>
<td>3,414</td>
<td>5,840</td>
<td>4,027</td>
</tr>
<tr>
<td>Revenues from sales ('000 Lek)</td>
<td>19,288,043</td>
<td>10,820,285</td>
<td>24,960,187</td>
<td>24,563,052</td>
</tr>
<tr>
<td>Sales in regulated market (tariff based)</td>
<td>13,945,046</td>
<td>9,677,109</td>
<td>8,919,723</td>
<td>8,088,303</td>
</tr>
<tr>
<td>Sales in deregulated market (negotiated price)</td>
<td>5,342,997</td>
<td>1,136,024</td>
<td>16,031,809</td>
<td>16,466,418</td>
</tr>
<tr>
<td>Accounts Receivable ('000 Lek)</td>
<td>53,636,343</td>
<td>62,228,022</td>
<td>56,926,114</td>
<td>38,117,858</td>
</tr>
<tr>
<td>Accounts Payable ('000 Lek)</td>
<td>50,513,314</td>
<td>64,192,159</td>
<td>53,889,602</td>
<td>39,272,103</td>
</tr>
<tr>
<td>Fixed Operational Expenses ('000 Lek)</td>
<td>1,676,101</td>
<td>1,854,945</td>
<td>2,300,322</td>
<td>1,681,662</td>
</tr>
</tbody>
</table>

Note: Fixed Operational Expenses are expenses for the activity of the company and do not include equipment depreciation and the cost of energy purchases.

Sales of electricity to cover losses in the distribution network constitute a reasonable share of KESH’s income.

For the years 2012, 2013, the power sold to CEZ, to cover losses in distribution, was billed at the imports price, realizing respectively 58% and 49% of the total revenues for those years.

In 2015, electricity sold to cover losses was charged by the price of the stock exchange HUPX, realizing only 19% of the total revenue for this year.

Financial and Economic Indicators

<table>
<thead>
<tr>
<th>Loan Portfolio Management</th>
<th>Year 2015</th>
<th>Year 2014</th>
<th>Year 2013</th>
<th>Year 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Value of short-term Loans in Lek ('000)</td>
<td>26,350,713</td>
<td>27,545,848</td>
<td>24,017,204</td>
<td>17,918,220</td>
</tr>
<tr>
<td>The Interest Rates for the Loans in Lek (%)</td>
<td>4.69%</td>
<td>5.30%</td>
<td>7.02%</td>
<td>4.46%</td>
</tr>
<tr>
<td>Total Value of short-term Loans in Euro ('000)</td>
<td>53,384</td>
<td>46,135</td>
<td>43,620</td>
<td>49,160</td>
</tr>
<tr>
<td>The Interest Rates for the Loans in Euro (%)</td>
<td>3.53%</td>
<td>4.53%</td>
<td>4.85%</td>
<td>8.22%</td>
</tr>
<tr>
<td>Total Value of the Loans ('000 Lek Equivalent)</td>
<td>33,679,278</td>
<td>34,011,261</td>
<td>30,132,731</td>
<td>27,780,406</td>
</tr>
<tr>
<td>Interest Expenses ('000 lek)</td>
<td>1,495,906</td>
<td>1,753,098</td>
<td>1,983,703</td>
<td>1,759,889</td>
</tr>
<tr>
<td>Average Interest Rate (%)</td>
<td>4.44%</td>
<td>5.15%</td>
<td>6.58%</td>
<td>7.10%</td>
</tr>
</tbody>
</table>

Improvements of Short-term Loans (OD) portfolio of the KESH during 2015 consists of:

- OD portfolio reduction in the amount of 952 million ALL (about 7 million EUR), compared to 2014.
- The sharp reduction of the costs for the debt service (OD), which at the end of 2015 was about 2 million EUR (15%) less than in 2014.
- Reduction of the average interest rate calculated at 4.44%, around 1.4% less than the average of the past 4 years.

DURING 2015, due to the effective administration of activities, by generating over 19 billion Lek revenues from sales of energy, and by apparently decreasing the operational expenses without creating new payable obligations, KESH HAS REALISED:

- The payment of the total current obligations for the year 2015 toward SPPs & PPPs, in the amount of 8.64 billion Lek, without generating new due payments.
- The full settlement with SPPs & PPPs for the remaining 5.3 billion Lek of obligations, accumulated during the regulatory period 2012-2014.
- The payment of the current tax obligations for 2015, about 746 million lek and 630 million lek overdue tax obligations (until 31 December 2013).
- The coverage, for the first time by the company’s own revenues, of the costs for the obligative import of energy supplied to tariff customers.
- About 1.3 billion Lek (company’s funds) investments, needed to guarantee the safety of the plants, increase the efficiency in generation and improve the working conditions.
The hydropower plants of the Drin River Cascade, due to their location, size and volume of the lakes, as well as the central role they play in electricity generation and the waterflow in the Drin River watershed, are classified as 1st class works, with regard to the risk level and the social and economic impact that their failure might cause.

Thus, ensuring the security of dams, lakes and hydropower works, increasing their lifespan as well as safe and reliable operation of the cascade scheme, are some of the major responsibilities of the Albanian Power Corporation. To keep up with these responsibilities, KESH consistently and continuously carries out operations related to the control and monitoring of plants, their maintenance and rehabilitation and to improve security conditions in dams and lakes.

**Controlling and Monitoring**

In order to guarantee the normal operation of its hydro works, KESH, besides the visual periodical inspection of dams, lakes, their banks and their hydro works, has installed a system of measuring devices that enable real-time monitoring of their security parameters. In summary, monitoring and control activities include:

- The geodetic, seismic and hydro-technical control and monitoring of dams.
- The geological control and monitoring of dams and the Porava massif on Lake Fierza.
- Control and monitoring of water infiltration in dams and their surrounding areas.
- Visual control and monitoring of dams and the resilience of lake shorelines.
- Control and monitoring of inflows and rainfall in the Drin watershed.
- Visual monitoring of lakes for floating waste pollution.
- Updating the “dams’ technical files” with projects for implementation, the annual reports of the technical condition, safety studies, and monitoring data conducted over the years.

KESH technical staff, periodically controls, processes and interprets data obtained from monitoring systems located in facilities and related amenities of the dams in specific areas.

Also KESH makes the relevant assessments and takes the appropriate measures for hydro risk management, by following the hydro-metrological situation in the Drin basin, controlling and monitoring flows in lakes and by safely discharging the HPP’s waters during situations of heavy rains, in accordance with the Surplus Water Discharge Regulation.

By operating safely the cascade and guaranteeing the operations’ security of the plants, by drafting an action plan for emergency cases, and by preparing maps of flooded areas, KESH increases and develops technical and human capacities to anticipate any unpleasant flooding situations due to water discharge.
Maintenance and Rehabilitation

Regarding maintenance and rehabilitation, based on the plant’s control and monitoring data, KESH defines the needs for reconstruction and rehabilitation interventions on dams and hydro works.

KESH hydro technical specialists, plan, coordinate and carry out periodic maintenance works on plants. They also draft designs, submit them for approval, as well as carry out the technical supervision and delivery of rehabilitation works on plants, and reflect them in periodic technical reports on the situation and the completed works.

Improving security conditions

To ensure the security of hydropower works and increase their lifespan, it is necessary to invest continuously in dams, lake shores and in the surrounding terrain of the hydropower plants, in order to maintain and improve their security and functional parameters.

In this regard, KESH, with its own funds and with loans from financial institutions, has undertaken and is implementing a number of development projects, for the completion of works and studies, aimed at improving the safety and operational conditions of the plants.

Projects carried out during the past 2 years:

- Unification of geodetic systems for all the dams of the cascade,
- Improve and rehabilitate the dam of Komani HPP and its serpentine road, up to the 142 meters level,
- Rehabilitation of the dam crown in Qyrsaq and Zadejë of Vau i Dejës HPP
- Setup and rehabilitation of the Fierza dam’s crown and the serpentine roads in its lower bottom,
- Protection with mountain dikes of the Gropaj, Nick Gjeci and Mark Ndrea streams in Fierzë HPP
- Improvement and protection with mountain dikes of the Lerin and Bugjon streams in the Lake Koman HPP
- Built mountain dikes on the Gomsiqe river in Vau Dejës HPP
- The territorial fencing and illumination of the Vau Dejës and Fierza HPPs

In case of emergencies, from very large inflows or possible damages or defects in the dams, by increasing the readiness of its structures and through close coordination with state structures responsible for civil emergencies, KESH plays a key role in minimizing or mitigating the flooding impacts downstream.

Ongoing Projects:

- The improvement of the lower parts of the Komani dam,
- The hydraulic modeling of No. 3 & 4 dischargers in Komani,
- Rehabilitation of the stairways to the No. 3 tunnel in Komani,
- Cleaning of the metallic nets in Komani
- Rehabilitation of the Rragam dam in Vau Dejës.
The normal and effective functioning of the Drin Cascade hydropower plants’ units and electro-mechanical equipment, guarantees functional continuity, the longevity of the plants, the safe operation of the cascade and improved of working conditions in these hydropower plants. On the other hand, these generating assets, built decades ago, have a need for rehabilitation and the introduction of new technologies, for aligning the operating, controlling and monitoring parameters of their technical condition with contemporary standards. Regarding the above, the operations for controlling, monitoring and maintaining the units and electro-mechanical devices, are some of KESH's main work activities. While their rehabilitation and technological renovation is considered a main objective in determining new investments.

The focus during the past two years has been the utilisation readiness and the continuous improvement of the exploitation technical level for the three hydropower plants of the cascade administered by KESH.

We can say that during these 2 years we have successfully achieved the objectives by:

- insuring maximum readiness of the generating capacity;
- monitoring working conditions of the units and transformers;
- minimizing failures and defects in machinery and equipment;
- keeping on functional standby the water discharge amenities.

**MONITORING & MAINTENANCE OF MACHINERIES AND EQUIPMENT**

The maintenance of power plants, the HPPs of Fierzë, Koman and Vau Dejës, is one of the ongoing work activities in KESH. KESH’s technical staff, continuously monitors the technical conditions of machinery and hydro-electro-mechanical equipment of the Drin River cascade hydropower plants, performs periodic maintenance overhauls, intervenes to repair defects and is responsible for their technical readiness.

As part of the maintenance framework, prophylactic and secondary repairs have been carried out on HPPs Fierza, Komani and Vau Dejës units, performing all the foreseen works, in accordance with the program. In June 2015 began the medium and capital repairs of the three Drin cascade hydropower plants’ units, according to the graphic reviewed and updated with the situation and priority of putting them in overhaul. All secondary and capital repairs for all the units in HPPs of Vau Dejës and Fierza were completed until September 2015. Within September, secondary repairs were completed on aggregates 1 and 4 in Koman HPP.

**Units Availability Indicators**

<table>
<thead>
<tr>
<th>Performance Indicators</th>
<th>2015</th>
<th>2014</th>
<th>2013</th>
<th>Av. 5-yrs.</th>
</tr>
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<tbody>
<tr>
<td>Power Production (TWh)</td>
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<td>5.20</td>
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<td>43,433</td>
<td>71,648</td>
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<tr>
<td>Default Hours (OA)</td>
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<td>155</td>
<td>184</td>
<td>260</td>
</tr>
<tr>
<td>Avail. Index (OP/OP + OA)</td>
<td>99.88%</td>
<td>99.64%</td>
<td>99.74%</td>
<td>98.51%</td>
</tr>
<tr>
<td>No. of Default Cases (RAD)</td>
<td>44</td>
<td>71</td>
<td>136</td>
<td>154</td>
</tr>
<tr>
<td>Work hrs. between defaults (OP/RAD)</td>
<td>1,210</td>
<td>612</td>
<td>527</td>
<td>392</td>
</tr>
</tbody>
</table>
Technological Rehabilitation and Renovation

The most significant development during this period is undoubtedly the process of the electromechanical rehabilitation of Komani HPP units. This investment, made possible by loans from the World Bank, is being carried out by the company ANDRITZ Hydro, with the cooperation and technical supervision of the technical staff of KESH. The process began with the rehabilitation of Unit 2, in February 2014. Currently, the rehabilitation of this unit has been completed and rehabilitation work has begun on Unit 3.

The Albanian Power Corporation has conducted a series of investments with its own funds, for the rehabilitation and renovation of electromechanical machinery and equipment, on the three Drin Cascade HPPs.

These investments are mainly focused on the following areas:

- Monitoring of working and technical condition of machinery and equipment, to prevent in time any breakdown or defects.
- Technological renovation and improvement of the units' regulatory systems, in order to increase the level of security and improve the functional sustainability parameters.
- Technical support with measuring and testing devices and equipment for the transformers, generators and other equipment's parameters, in order to increase the technical level, for the timely diagnosing of problems, as well as for their repair.

Main Investments during 2014

Supply and installation of the on-line Monitoring System BMT, the passing insulators for units' transformers in Fierza, Komani and Vau Dejës HPPs, as well as a set of on-line DGA equipment for one of the power transformers' oil in HPP Koman.

Investment value: 197.9 million Lek

Supply and installation of the 3-polar switch, 245 kV with SF6 gas and supply of the 220KV 3-polar disconnectors in Fierza.

Investment value: 17.6 million Lek

Purchase and installation of two power transformers, 60MVA, 242 / 10.5 KV for HPP Vau Dejës.

Investment value: 185.1 million Lek

Main Investments during 2015

Supply and installation of the new Digital Static Excitation AVR / FCR, with 2 automatic channels, for one of the generators in HPP Vau Dejës, and dismantling, installation and integration to the central on-line system of the DGA set for the new transformers T2 & T3.

Investment value: 132.9 million Lek

Repair of the 170MVA stand-by transformer in Komani HPP.

Investment value: 34.6 million Lek

Portable digital device for testing HV & MV circuit breakers and Kelvin digital bridges to measure ohmic resistance in the transformers for all the HPPs.

Investment value: 20.5 million Lek
Guaranteeing the security of the biggest hydro plants in the Albanian Power System and increasing their lifespan, requires investments, expertise and ongoing technical assistance, to maintain and improve safety and operating conditions. Due to necessity and urgency, part of the KESH investments are made possible from grants or loans from international financial institutions like the World Bank, EBRD, KfW, Swiss government, etc. These funds are mainly directed to those investment and rehabilitation projects of significant value, as well as for technical assistance, to conduct studies or draft development projects, which require a level of expertise, experience and professionalism that can only be provided from international companies. The Project Implementation Unit for Dam Safety and Rehabilitation PMU-PRSD was created for coordinating the work between KESH’s operating structures, financial institutions and contractors. PMU is currently coordinating the use of funds from the following financial lines:

**Loans from the World Bank (IDA/IBRD)**
21,700,000 SDR from IDA & 15,500,000 EURO from IBRD.

**Electromechanical rehabilitation and installation of the new control-monitoring system at HPP-Koman (2012-2017)**
The contract with Andritz Hydro (Austria), worth 26,843,659 Euro, includes the rehabilitation of the four aggregates in HPP Koman. We are at the implementation stage and 57% of the funds have been disbursed. Specifically, the first generation unit has been rehabilitated and is in operation, and the rehabilitation of the second one is ongoing.

**Rehabilitation of the discharge and overhaul gates’ at HPPs Fierza and Komani.**
This package is still in process of the financial evaluation and tender dossier preparation.

**Strengthening the dam safety program, implementing the risk study methodology and compilation of emergency plans. 2014**
The contract with Gas Natural Fenosa (Spain), worth 290,818 Euro, was successfully implemented. The emergency plans have been prepared for HPP Fierzë, Koman and Vau Dejës and the National Committee on Large Dams is expected to approve them. 60% of the fund has been disbursed.

**The feasibility study, design and tender preparation for the secure management of the plots in the cascade’s HPPs.**
The contract worth 1,967,757 Euro, signed in November 2014 with Fichtner (Germany) is being implemented. The preliminary data collection for this project has been completed and activities are continuing as scheduled. 60% of the funds have been disbursed.

**Consultancy services for the implementation of projects**
Since December 2009, the company AF Consult (Switzerland) is implementing the project’s Technical Assistance, valued 3,369,728 Euro. Until now, 84.1% of the contract has been implemented and will continue until the end of this financing.

The Experts Panel is an advisory structure of experts at KESH, to support decisions related to technical aspects of the projects. The panel consists of three experienced experts in the fields of hydrology, hydraulics and geology-geotechnical. The amount disbursed for this service is EUR 400,000.

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## Development Projects

### Loans from the European Bank for Reconstruction and Development (EBRD)

**12,700,000 EURO**

**Protective measures from rock falls on Komani HPP’s dam.**

The contract's implementation with the company CAN (France) has been completed. The contract value is EUR 830,959.37, of which 77.65% of the funds have been disbursed.

**Rehabilitation measures at the Komani dam toe and evading deposits in the discharge canal.**

The contract signed in February 2014 with the company Porr (Austria) includes two lots. Lot 1, “Rehabilitating measures at the Komani dam toe” and Lot 2, “Evading deposits in the discharge canal of Komani HPP”. The work for Lot 2 has been completed in time. Work continues as foreseen in Lot 1, which will end within the first quarter of 2016. Out of the contract value of 5,175,784 Euros, 61.1% of the funds have been disbursed.

### Grant from the Swiss State Secretariat for Economic Affairs SECO

**6,400,000 CHF**

**Supply and installation of the geological and seismic monitoring systems of the HPP dams in the rivers Drin and Mat.**

These works were carried out during April 2015-November 2013 by the company Solexpert AG, Switzerland, for the amount of 1,912,634.02 CHF Euro, of which 100% has been disbursed.

**Supply and installation of the geodetic monitoring systems of the HPP dams in the rivers Drin and Mat**

These works were carried out during February 2012-October 2012 by the company BSF Swissphoto, Switzerland, for the amount of 638,286.90 CHF Euro, of which 100% has been disbursed.

**Implementation of protective measures from the risk of falling rocks on the dam of HPP Fierzë**

The contract with Crestageo AG, Switzerland, for the amount of 2,134,207 CHF Euro, was fully implemented and 100% of funds have been disbursed.

### KfW soft loans financing:

**20,000,000 EURO**

**Rehabilitation of the spillway gates of Vau Dejës HPP.**

This project involves the construction of new overhaul gates and the electro mechanic rehabilitation of the discharge gates in HPP Vau Dejës. Implementation of this component has not yet started.

**Consultancy Services for Project Implementation.**

This component includes financing a consulting company to assist KESH in the implementation of projects financed by the KfW loan. The implementation of this component is in the drafting stage of the Terms of Reference for the selection of the consultant.

**Establishment of Drin Cascade Monitoring and Control Center**

This project relates to the establishment of a central SCADA system for controlling, monitoring and the safe operation of the Drin Cascade hydropower plants. This system will enable the monitoring of safety parameters of the hydro works and the technical status of the generation units, equipments and hydro-electro-mechanical devices for each HPP of the cascade. The hydrologic model of the cascade will be integrated in this system, with the basin’s hydro-meteorological data, to ensure the safe operation of the plants, optimizing energy production, managing the flow, and controlling water discharges. A feasibility study from an international consultant is required for the implementation of this project. This study will be financed by KfW grant funds. Currently, KESH and KFW are finalizing the selection process for the consultant.
Drin is the longest river of the Albanian territories, with a length of 160 km. Drin River forms near Kukës from the merge of its two main branches: the White Drin that springs near Peja and flows into Fierzë Lake, and the Black Drin which stems from Struga at Ohrid Lake. The Drin River bed in northern Albania has been transformed into a chain of artificial reservoirs (Fierza, Koman and Vau Dejës), which supply water to the three large hydropower plants of the cascade. Drin’s main branches are the rivers Shalë and Valbona, stemming from the Alps and flow to Lake Koman. Near Shkodra, Drin merges with the Buna River, to drain into the Adriatic Sea.

The hydropower plants of Fierza, Koman, Vau Dejës and Ashta are built on the Drin River bed, with an installed capacity of about 1400MW, of which, the Albanian Power Corporation administers the first three:

- **Fierza HPP** began operations in 1978 and has an installed power of 500 MW (4 x 125 MW).
- **Koman HPP** began operations in 1985, with an installed power of 600 MW (4 x 150 MW).
- **Vau i Dejës HPP** began operations in 1971, with an installed power of 250 MW (5 x 50 MW).

HPP Skavica envisaged in a study for the exploitation of Black Drin’s energy potential as a development possibility because, apart from power generation, it enables the much needed multiyear regulation of the cascade, increases the effective use of other hydropower plants, and minimizes the possibility of flooding in sub-Shkodra region.

The cascade’s economic importance is mainly related to the generation of electricity. But it also, controls the waterflow, reducing the frequency and risk for flooding Drin’s downstream. The cascade lakes create opportunities for the development of local auxiliary economic activities (fishing, transport, tourism).

The cascade's HPPs are counted for 79% of the energy production capacities in Albania. These asset value is about 184 billion Lek.

The cascade's HPPs produce on average 3,850 GWh of electricity per year, creating an average income of 19 billion Lek, representing 1.3% of GDP. Depending on meteorological conditions, energy production can vary from 2,500 to 7,000 Gwh.

The cascade's energy production is about 54% of total domestic demand for electricity and covers about 79% of the needs of tariff customers (households & public institutions).

The cascade's hydropower plants cover 100% of the Transmission System Operator needs for ancillary and balancing services, necessary for maintaining the security and stability of the electric power system.

*The Drin River Cascade is unique in Europe, in regard to the dam types and their heights, the lakes created, the installed power of the HPPs and their operational management.*
Power Production of the Drin River Cascade for the period 2001-2015, in regard to water inflow in Fierza

Economic Impact of the Cascade

- The sustainable production of energy, at the lowest costs for tariff customers, through optimization and production planning.
- Guaranteed the effectivity, safety and normal operation of hydropower plants, through ongoing maintenance and rehabilitation.
- Providing quality ancillary services for the domestic electric system, by increasing system security and reliability.
- Increasing the security and lifespan of dams, lakes and hydrotechnical facilities, through monitoring, maintenance and rehabilitation.

Production since the beginning of operations of the Drin Cascade's HPPs

- Production of Vau i Dejës HPP
- Production of Fierza HPP
- Production of Komani HPP
- Production of the Cascade

Clean Energy that never depletes!

The sustainable production of energy, at the lowest costs for tariff customers, through optimization and production planning.

Guaranteeing the effectivity, safety and normal operation of hydropower plants, through ongoing maintenance and rehabilitation.

Providing quality ancillary services for the domestic electric system, by increasing system security and reliability.

Increasing the security and lifespan of dams, lakes and hydrotechnical facilities, through monitoring, maintenance and rehabilitation.
FIERZA Hydropower Plant

**Total Volume**: $2.7 \times 10^9$ m$^3$

**Active Volume**: $2.3 \times 10^9$ m$^3$

**TWL**: 296.0 m a.s.l.

**Minimum Operational level**: 240.0 m a.s.l.

**Dam Crest**: 312.0 m a.s.l.

**Bottom Level**: 176.0 m a.s.l.

**Installed Power**: 4 x 125 MW = 500 MW

**Discharge Capacity**: ~1.8 x10$^7$ kWh (30%)

**Historical data on average annual flow and gross power production in Fierza HPP**

**Technical Design Indicators**

- **Installed Power**: 4 x 125 MW
- **No. & Type of Turbines**: 4 Vertical “Francis”
- **Water Processing Cap.**: 4 x 123.5 m$^3$/sec
- **Mean Annual Production**: 1,300 GWh
- **HPP Risk Rating**: 1st Class
- **Construction Time**: 1971 - 1980
- **Lake Filling Year**: 1978
- **Dam Type**: Earth Filled Clay Core
- **Geographical Position**: 44°15'55” N, 20°02’32”
- **Dam Height**: 151.5 m a.s.l.
- **Dam Crest Level**: 312.0 m a.s.l.
- **Dam Crest Length**: 380.0 m
- **Dam Crest Width**: 10.0 m
- **Dam Volume**: 8 million m$^3$
- **Top Water Level**: 296.0 m a.s.l.
- **Minimal Working Level**: 240.0 m a.s.l.
- **Catchment Area**: 11,829 km$^2$
- **Mean Annual Flow**: 292 m$^3$/sec
- **Lake’s Total Volume**: 2.7 billion m$^3$
- **Lake’s Active Volume**: 2.3 billion m$^3$
- **Discharge Capacity**: 2.670 million m$^3$/sec
- **Number of Discharge Units**: 4
- **Type of Discharge Units**: Tunnels / Radial Gates
Fierza is the upper HPP of the Drin River Cascade. Based on the installed power, position and the volume of the reservoir, Fierza plays a key role for the exploitation, regulation and safe operation of the cascade.

Work for its construction began in 1970. The first unit became operational in 1978. The plant was put in total operation with full capacity in 1980. Fierza was built with equipment from China, but on the concepts of Albanian engineers. Around 14,000 workers, engineers and specialists were involved for the construction of this plant.

The Fierza is a Hydropower Plant with the dam and reservoir. The dam is filled with stones and has a clay core. The dam is 161.5 m high and 380 m long. The width of the dam ranges from 576 m in its base to 13 m in the crest of the dam. When it was built, Fierza Dam was the second in Europe for the height of its type. The dam has a total volume of 8 million m³. The dam has created a reservoir with a volume of 2.7 billion m³ and a surface area of 72 km²; Lake Fierzë, which is the largest artificial lake in the country. The useful volume of the reservoir is 2.3 billion m³.

Fierza HPP is classified as a first-class work in terms of risk. Its dam is designed for maximum calculated flow for 1 in 1,000 years (6,100 m³/sec) and maximum control flow during the rainy season for 1 in 10,000 years (9,600 m³/sec).

The bypassing of the water flow in Fierza is carried out through discharge tunnels: Tunnel 4 with a capacity of 890 m³/sec. and Tunnel 3 with a capacity of 1780 m³/sec. The total water discharge capacity at the 296 m a.s.l. is 2670 m³/sec. The Intake System was built for the water supply of the plant from the lake. It conveys water from the intake portal, through tunnels, to the 4 turbines of the power plant building. The system has a capacity to transport up to 500 m³/sec.

The four units installed in the plant have “Francis” vertical turbines, with 125 MW power each; 3-Phase synchronous generators of 13.8kV voltage; and lifting transformers 13.8kV / 242kV for connecting with the substation. The total installed power and the HPP is 500 MW. Auxiliary and control-monitoring devices are also located in the plant’s building.

The substation, with its transmission, control and protection equipment, enables the connection with the Power System via four 220 Kv lines (Fierzë-Tirana, Fierzë-Koman, Fierzë-Elbasan, Fierzë-Prizren) and two 110 Kv lines (Bajram Curri-Fierzë, Fierzë-Fushë Arrëz).

The annual output of the Fierzë HPP averages 1,330 GWh. This amount represents approximately 33% of the Cascade’s production.

The importance of Fierza, besides energy production, relates to the capacity of its lake, which regulates the annual inflows, increasing the efficient use throughout the cascade.

"The large capacity of Fierza Lake makes it possible to store the water from the rainy season inflow, and use it for energy production during the dry season."
FIERZA Hydropower Plant

GENERAL LAYOUT OF THE PLANT

Drin River

Output of Discharge Tunnel 4

Output of Discharge Tunnel 3

Power Plant

DAM

Fierza Lake

SubStation

Intake Portal

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KOMANI HYRO POWER PLANT
**KOMANI Hydropower Plant**

**The schematic overview of Vau i Dejës HPP**

- **Total Volume**: $0.5 \times 10^9$ m$^3$
- **Active Volume**: $0.188 \times 10^9$ m$^3$
- **Min. Operational level**: 160.0 m a.s.l.
- **Dam Crest**: 185.0 m a.s.l.

**Historical data on average annual flow and gross power production in HPP Koman**

<table>
<thead>
<tr>
<th>Year</th>
<th>Mean Annual Flow (m³/sec)</th>
<th>Gross Power Production of HIC Koman (GWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>1,526.7</td>
<td>2,872.7</td>
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<tr>
<td>2002</td>
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<td>2,402.3</td>
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<tr>
<td>2003</td>
<td>1,969.0</td>
<td>2,439.4</td>
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<tr>
<td>2004</td>
<td>2,146.0</td>
<td>2,444.6</td>
</tr>
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<td>2005</td>
<td>2,186.9</td>
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<td>2006</td>
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</tr>
<tr>
<td>2015</td>
<td>2,186.9</td>
<td>2,444.6</td>
</tr>
</tbody>
</table>

**Technical Design Indicators**

- **Installed Power**: 4 x 150 MW = 600 MW
- **Total Volume**: $9,114 \times 10^6$ m$^3$
- **Active Volume**: $0.188 \times 10^9$ m$^3$
- **Min. Operational level**: 160.0 m a.s.l.
- **Dam Crest**: 185.0 m a.s.l.

**Mean Annual Production**

- **Gross Power Production**: 30%
- **Lake's Total Volume**: 500 million m$^3$
- **Lake's Active Volume**: 188 million m$^3$
- **Discharge Capacity**: 3,600 m³/second
- **Discharge Units**: 2
- **Type of Discharge Units**: Tunnels/Radial Gates

**Historical Data**

- **Mean Annual Flow**: 289 m³/second
- **Catchment Area**: 12,850 km²
- **Lake Filling Year**: 1985
- **1st Class**: 1981 - 1988

**Other Technical Details**

- **Concrete Screen**: V42 06’18” / L19 49’32”
- **Dam Height**: 115.5 m a.s.l.
- **Dam Crest Level**: 175.5 m a.s.l.
- **Top Water Level**: 175.5 m a.s.l.
- **Bottom Level**: 160.0 m a.s.l.
- **Catchment Area**: 1,199.8 km²
- **Mean Annual Flow**: 100 m³/second
- **Discharge Capacity**: 3,600 m³/second
- **Discharge Units**: 2
- **Type of Discharge Units**: Tunnels/Radial Gates

**Schematic Diagram**

- **Average annual inflow**: $9,114 \times 10^6$ m$^3$
Komani Hydropower Plant

Komani is the second and most powerful HPP of the Drin River Cascade. Considering the installed power, position and the volume of the reservoir, this HPP plays an important role for the exploitation of the entire cascade. Komani HPP has the biggest power generation capacity in the country.

Work for its construction began in 1980. The first turbine started working in 1985. The plant was put into operation, at full capacity, in 1988. HPP Komani was built on the concepts developed and projects prepared by the Albanian engineers of the Institute of Study-Projects of Hydropower in Tirana. The turbines and generators are French technology, which were installed in cooperation with Albanian experts of this field. Around 12,000 workers, engineers and specialists were involved for its construction. The small reservoir volume and rapid precipitation discharges from the Alps and the Puka highlands, necessitate the dynamic monitoring of the hydro situation and the proactive operation of the HPP, in accordance with the specific meteorological conditions of the Koman watershed.

Komani HPP also, is considered as a first-class work in terms of economic, social and environmental risks. Komani has a 500 million m³ reservoir and a 5 million m³ concrete screen rock filled dam. This dam is 115 m high and reaches 179 m.a.s.l at its crest. Normal top water level for Komani Plant is above 170 m.a.s.l with a maximum of 175.5 m.a.s.l.

Komani dam is designed for maximum calculated flow during the rainy season, for 1 in 1,000 years (7,245 m³/sec), and maximum control flow during the rainy season for 1 in 10,000 years (10,560 m³/sec).

The bypass of the water flow in Komani is carried out through discharge tunnels: Tunnel 3 with a capacity of 1800 m³/sec and Tunnel 4 with a capacity of 1600 m³/sec. The total water discharge capacity at the 176 m level is 3400 m³/sec. The Intake System was built for the supply of water from the lake to the plant. It conveys water from the Intake Portal, through two tunnels, at the balance towers, from this point the tunnel split into 4 intake pipes, one for each turbine of the power plant. The system has a capacity to transport up to 720 m³/sec.

The generation units installed in the plant have “Francis” vertical turbines, with 156 MW power each. 3-Phase synchronous generators of 13.8kV voltage; active force 150 MW (Alstom France) and 170 MVA, 13.8kV / 242kV lifting transformers to connect with the substation. The total power and the HPP is 600 MW. Auxiliary and control-monitoring devices are also located in the Plant’s building.

The substation with its transmission, control and protection equipment, enables the connection with the Power System via four 220 Kv lines (double-line Koman-Tirana, Koman-Fierzë and Koman-Vau i Dejës).

The annual output of the Komani HPP is on average 1,800 GWh. This amount represents approximately 45% of the Cascade's production.

The importance of Komani Hydro power Plant relates primarily to its energy production capacity, as the most important generator of the Electricity System. Komani Lake, due to its level stability, is used for the transport of the goods and passengers, throughout the year, in such a remote and mountainous area. Traveling through Komani Lake is also considered to be a beautiful attraction for the wild nature loving tourists.

The rapid hydro dynamics of the specific watershed area and Lake Koman, impose special attention in terms of HPP’s monitoring and operation

### Technical Utilisation Parameters of Komani HPP

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installed Capacity (4 Uts.)</td>
<td>600 MW</td>
</tr>
<tr>
<td>Nominal Power of Generators</td>
<td>150 MW</td>
</tr>
<tr>
<td>Net Head</td>
<td>96 m</td>
</tr>
<tr>
<td>Nominal Water consumption/Uts.</td>
<td>184 m³/s</td>
</tr>
</tbody>
</table>

#### Mean Annual Production

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1,811,186 MWh</td>
<td>1,918,560 MWh</td>
<td>1,955,406 MWh</td>
<td>1,199,790 MWh</td>
<td>2,872,730 MWh</td>
</tr>
</tbody>
</table>

#### Mean Annual Flow

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>263 m³/s</td>
<td>277 m³/s</td>
<td>290 m³/s</td>
<td></td>
</tr>
</tbody>
</table>

#### Operational Top Water Level

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Average of last 20 years</th>
<th>Average of last 10 years</th>
<th>Minimum (January 1999)</th>
<th>Maximum (June 1991)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>171.60 m</td>
<td>172.07 m</td>
<td>166.33 m</td>
<td>174.70 m</td>
</tr>
</tbody>
</table>
GENERAL LAYOUT OF THE PLANT

- Intake Tunnels 1 & 2
- Intake Portal
- Balancing Towers
- Intake Penstocks
- Discharge Tunnel No. 4
- Discharge Tunnel No. 3
- Discharge Gate No. 4
- Discharge Gate No. 3
- Deviation Tunnels

Clean Energy that never depletes!
VAU i DEJËS Hydro Power Plant
The schematic overview of Vau i Dejës HPP

**Installed Power**
- 5 x 50 MW

**No. & Type of Turbines**
- 5 Vertical “Francis”

**Mean Annual Production**
- 1,000 GWh

**HPP Risk Rating**
- 1st - Class

**Construction Time**
- 1965 - 1973

**Lake Filling Year**
- 1970

**Dam Type**
- Concrete & soil filled

**Geographical Position**
- N42°00’48”/E19°38’9”

**Dams Crest Level**
- 79.0 m a.s.l.

**Zadeja Dam**
- Height: 60m, Length: 380m, Width: 330m
- Volume: 3.5 million m³
- Discharge Capacity: 6,700 m³/sec
- Type of Discharge Units: 5 spillways & 1 tunnel

**Qyrsaq Dam**
- Height: 54m, Length: 548m, Width: 230m
- Volume: 580 million m³

**Rragami Dam**
- Height: 21m, Length: 270m
- Volume: 263 million m³

**Catchment Area**
- 14,173 km²

**Mean Annual Flow**
- 278 m³/sec

**Average annual inflow:** 6,370 x 10⁶ m³

**Total Volume:** 0.58 x 10⁹ m³

**Active Volume:** 0.263 x 10⁹ m³

**Minimal Working Level:** 61.0 m a.s.l.

**TWL:** 76.0 m a.s.l.

**Historical data on average annual flow and gross power production in HPP Vau i Dejës**

- Gross Power Production of Vau i Dejës HPP (GWh)
- Mean annual flow (m³/sec.)

### Technical Design Indicators

<table>
<thead>
<tr>
<th>Installed Power</th>
<th>5 x 50 MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. &amp; Type of Turbines</td>
<td>5 Vertical “Francis”</td>
</tr>
<tr>
<td>Water Processing Cap</td>
<td>5 x 113.0 m³/sec</td>
</tr>
<tr>
<td>Mean Annual Production</td>
<td>1,000 GWh</td>
</tr>
<tr>
<td>HPP Risk Rating</td>
<td>1st - Class</td>
</tr>
<tr>
<td>Construction Time</td>
<td>1965 - 1973</td>
</tr>
<tr>
<td>Lake Filling Year</td>
<td>1970</td>
</tr>
<tr>
<td>Dam Type</td>
<td>Concrete &amp; soil filled</td>
</tr>
<tr>
<td>Geographical Position</td>
<td>N42°00’48”/E19°38’9”</td>
</tr>
<tr>
<td>Dams Crest Level</td>
<td>79.0 m a.s.l.</td>
</tr>
<tr>
<td>Zadeja Dam</td>
<td>Height: 60m, Length: 380m, Width: 330m</td>
</tr>
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<td>Qyrsaq Dam</td>
<td>Height: 54m, Length: 548m, Width: 230m</td>
</tr>
<tr>
<td>Rragami Dam</td>
<td>Height: 21m, Length: 270m</td>
</tr>
<tr>
<td>Dams Volume</td>
<td>3.5 million m³</td>
</tr>
<tr>
<td>Top Water Level</td>
<td>76.0 m a.s.l.</td>
</tr>
<tr>
<td>Minimal Working Level</td>
<td>61.0 m a.s.l.</td>
</tr>
<tr>
<td>Catchment Area</td>
<td>14,173 km²</td>
</tr>
<tr>
<td>Mean Annual Flow</td>
<td>310 m³/sec</td>
</tr>
<tr>
<td>Laka’s Total Volume</td>
<td>580 million m³</td>
</tr>
<tr>
<td>Laka’s Active Volume</td>
<td>263 million m³</td>
</tr>
<tr>
<td>Discharge Capacity</td>
<td>6,700 m³/sec</td>
</tr>
<tr>
<td>Number of Discharge Units</td>
<td>5 with Radial Gates</td>
</tr>
<tr>
<td>Type of Discharge Units</td>
<td>4 spillways &amp; 1 tunnel</td>
</tr>
</tbody>
</table>
Vau i Dejës was the first hydropower plant built on the Drin River and is located in the northwestern part of Albania. It is located downstream of Drin River, at Vau i Dejës gorge, about 18 km from the city of Shkodra. Since Vau i Dejës is the lower hydropower dam and lake in the river cascade, its importance, apart from electricity generation, is also related to the impact that its lake has on the sub-Shkodra lowlands. Water discharges from the lake have a major impact in floods that occur in the lowlands of Lezha and Shkodra.

Works for its construction began in 1967. This plant was put into operation in two phases: Ag. 1, 2 and 3 in 1970, while Ag. 4 & 5 in 1975. Vau i Dejës HPP is of the dam and lake type. Three separate dams were built to create its lake:

- Qysraqi dam is 46.4m high and 440m long. The type is partly gravitational, made of concrete and partly earth filled with local materials of limestone formation. 4 spillway with radial gates are installed on the concrete part of the dam, as well as the intake unit with double segmented gates, from which 5 penstocks merge to bring water into the plant's generation units. The maximum discharge capacity of the spillways is 3500 m³/s, while the units’ water processing capacity is 4 X 113 m³/s.

- Zadeja dam, with a height of 60m and 390m in length, is of earth filling type, with local limestone material. This dam also contains a discharge tunnel with segmented gate, with a discharge capacity of 3200 m³/s.

- Rragami dam has a height of 34m and a length of 320m. This dam is filled with local materials of limestone and flysch formation. There are no hydro works in this dam. It only serves as a barrier for water retention.

The maximum volume of Vau i Dejës lake is 580 million m³. Its surface is 25km² and it climbs from the Vau i Dejës Gorge for about 27km upstream the Drin River valley, near the HPP Koman. The maximum top water level of the lake is 76m a.s.l., while the minimum operational level is 61m a.s.l.. The plant has a 54m head and the active volume of the lake is 263 million m³.

As part of the cascade, Vau i Dejës HPP is designed as a first-class work in terms of the risk bearing level. The safe maximum flow for 1 in 10,000 years was calculated at 10000 m³/sec. The total discharge capacity of the HPP at the 76m level is 7500 m³/sec.

The generation units installed in the plant have "Francis" vertical turbines, with 50MW power each; 3-phase synchronous generators and lifting transformers for connecting with the substation. The total installed power of the HPP is 250 MW. Auxiliary and control-monitoring devices are also located in the Plant's building. The average annual production is 1000 Gwh.

The plant was constructed using Chinese equipments and technology, but it went through a full rehabilitation in the years 2003-2007; mechanical equipments from Andritz and electrical and control installations from Alstom.

The substation with its transmission, control and protection equipment enables the connection with the Power System via 220 Kv lines (Vau i Dejës-Tirana, Vau i Dejës- Koman and Vau i Dejës-Elbasan).
VAU i DEJËS Hydropower Plant

GENERAL LAYOUT OF THE PLANT

- Intake Portal
- Spillway Gates
- Spillway Duct
- Zadeja Discharge Gates
- Zadeja Discharge Tunnel
- Zadeja DAM
- LAKE
- Drin River

Clean Energy that never depletes!