Part I:
Basic information about hydro power plants and the related market
HYDRO POWER is the most advanced and reliable source of renewable energy for electricity production.

Andritz VA TECH HYDRO is a global supplier of turnkey electromechanical equipment and services ("Water to Wire") for hydropower plants with a leading position in the growing market of plant refurbishment.
Types of hydro power stations

Run-of-river power stations:

- For low head and high water quantity
- Secure base load
- Installed in medium and lower sections of rivers

In 2004, the market for run-of-river power stations was in the range of about 1,100 MW (17 projects)*

* Source: Water Power & Dam Construction Yearbook 2005, new installations larger 5 MW
Types of hydro power stations (cont‘d)

Storage power stations:

- For higher heads and lower water quantity
- Secure constant electricity generation by averaging the yearly water flow
- Provide support to daily demand variation

In 2004, the market for storage power stations was in the range of about 9,200 MW (29 projects)*

* Source: Water Power & Dam Construction Yearbook 2005, new installations larger 5 MW
Types of hydro power stations (cont‘d)

Pump storage power stations:
- Cover peak load demand
- Provide stability to the grid

In 2004, the market for pump storage power stations was in the range of about 6,900 MW (6 projects)*

* Source: Water Power & Dam Construction Yearbook 2005, new installations larger 5 MW
New emphasis on pump storage

How does pump storage work:

Electricity surplus during low demand periods → stored energy

Stored energy → Electricity production during high demand periods

Electricity demand

- Surplus
- Base load

Pump operation

Grid

Motor

Pump

Generator

Turbine

Peak load

Turbine operation

Grid
Advantages of pump storage:

- Balancing of peak load (daily, weekly, yearly)
- Stabilizing the grid ("ancillary services")
- Balancing the impact of wind, solar and base load energy

„No expansion of wind energy without pump storage“

Andritz VA TECH HYDRO supplies the full range of know-how for pump storage power stations including

- Separate storage pumps
- Reversible single and multi-stage pump turbines (up to 1,200 m head)
- Motor generators with variable speed

Andritz VA TECH HYDRO is one of the global leaders for pump storage!
Turbine characteristics

Andritz VA TECH HYDRO covers all types and sizes of turbines

**Storage / Pump storage:**
- Pelton
  - Output range: 0.1 - 400 MW/unit
  - Head range: 100 – 1,800 m
- Francis / Pump turbine
  - Output range: 0.1 - 800 MW/unit
  - Head range: 15 – 1000 m

**Run-of-river:**
- Kaplan / Bulb turbine
  - Output range: 0.1 –250 MW/unit
  - Head range: 2 - 70 m
Capacity range of power stations

Hydro power covers by far the widest range of output sizes/unit

Output in MW

1-3 units per plant

1-5 units per plant

1-32 units per plant

Hydro power covers by far the widest range of output sizes/unit

Output in MW

1 10 100 1000 10000

HYDRO

THERMAL

NUCLEAR
Hydro power is by far the most important renewable source for electricity. The annual avoidance of CO₂ generation through hydro power worldwide is 2,100 mt CO₂.

Hydro power has the best life cycle energy yield

**Efficiency [%]**
- Hydro: 90%
- Coal: 40%
- Nucl.: 40%
- Wind: 35%

**Life time [years]**
- Hydro: 60-90
- Coal: 35-40
- Nucl.: 35-40
- Wind: 20-25

**Operating hours [hours/year]**
- Hydro: 8,000
- Coal: 6,500
- Nucl.: 6,500
- Wind: 1,750

Source: Parlamentarischer Abend, Berlin 12.11.2003, Heimerl Strauß & Göde
Typical supply split for hydro power

Given the typical split between civil part and electromechanical equipment Andritz VA TECH HYDRO concentrates on turnkey electromechanical equipment supplies or partnering with civil companies in special markets for special cases.
## Sources of electricity generation

### 2001 vs. 2010E

<table>
<thead>
<tr>
<th>Year</th>
<th>Total TWh</th>
<th>Coal</th>
<th>Renewables</th>
<th>Gas</th>
<th>Nuclear</th>
<th>Oil</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>13,300</td>
<td>17%</td>
<td>18%</td>
<td>39%</td>
<td>8%</td>
<td>17%</td>
</tr>
<tr>
<td>2010E</td>
<td>16,400</td>
<td>14%</td>
<td>21%</td>
<td>35%</td>
<td>9%</td>
<td>14%</td>
</tr>
</tbody>
</table>

- **Coal**
- **Renewables**
- **Gas**
- **Nuclear**
- **Oil**

**Sources of electricity generation**

1) 92% Hydro Power Generation.

### Major developments

- Depletion of natural resources
- National independence of power generation
- Rising oil and gas prices
- Replacement of old fossile power plants
- Political influences (Kyoto Protocol)

Growing demand for renewable and environmentally friendly energies
Sources of electricity generation

Percentage of power generation contributed by hydro power:

- Austria 60%
- Germany 4%
- France 10%
- Norway 99%
- China 15%
- India 17%
- Russia 20%
- Canada 60%
- USA 7%
- Brazil 75%

- More than 760,000 MW of hydro power are in operation worldwide in 160 countries
- Hydro power provides more than 50% of national electricity supplies in 56 countries


Freudenau, Austria
### Market potential

**The predominant markets for rehabilitation and upgrades are Europe and North America**

<table>
<thead>
<tr>
<th>Region</th>
<th>Installed capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Europe</td>
<td>154,000 MW</td>
</tr>
<tr>
<td>North America</td>
<td>159,000 MW</td>
</tr>
<tr>
<td>Eastern Europe/Former SU</td>
<td>87,000 MW</td>
</tr>
<tr>
<td>Africa</td>
<td>13,000 MW</td>
</tr>
<tr>
<td>Middle East</td>
<td>30,000 MW</td>
</tr>
<tr>
<td>Developing Asia</td>
<td>192,000 MW</td>
</tr>
<tr>
<td>Central/South America</td>
<td>125,000 MW</td>
</tr>
</tbody>
</table>

Share of installed capacity older than 30 years

Source: VA TECH International GmbH; Reinhard Laurich; Hydropower Generation – Industry Analysis, 2003
## Electricity generation costs of various technologies

<table>
<thead>
<tr>
<th>Renewable Technologies</th>
<th>Costs/ US$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomass energy</td>
<td>5-15 ¢/kWh</td>
</tr>
<tr>
<td>Wind electricity</td>
<td>5-13 ¢/kWh</td>
</tr>
<tr>
<td>Solar photovoltaic electricity</td>
<td>25-125 ¢/kWh</td>
</tr>
<tr>
<td><strong>Hydroelectricity</strong></td>
<td></td>
</tr>
<tr>
<td>Large</td>
<td>2-8 ¢/kWh</td>
</tr>
<tr>
<td>Small</td>
<td>4-10 ¢/kWh</td>
</tr>
<tr>
<td>Geothermal energy</td>
<td>2-10 ¢/kWh</td>
</tr>
</tbody>
</table>

### Fossil-Fuel Technologies

<table>
<thead>
<tr>
<th>Fossil-Fuel Technologies</th>
<th>Costs in US$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulverised coal steam-electric plant with flue gas desulphurization</td>
<td>3.2-3.9 ¢/kWh</td>
</tr>
<tr>
<td>Natural gas combined cycle (NGCC) plant – air-cooled turbine</td>
<td>3.1-3.4 ¢/kWh</td>
</tr>
<tr>
<td>Diesel engine-generators</td>
<td>6.3-8.5 ¢/kWh</td>
</tr>
</tbody>
</table>

For hydro power, costs vary within a broad range depending on environmental factors, type and scope.

Source: HEA May 2003; proportional investment costs plus running costs
End of Part I
Andritz VA TECH HYDRO
Your partner for renewable and clean energy!
Part II:
Andritz VA TECH HYDRO
- History of VA TECH HYDRO

- Andritz VA TECH HYDRO
  - Business segments
  - Integration of VA TECH HYDRO

- Summary
History of VA TECH HYDRO

The pioneers laid the foundations. We can draw on more than 160 years of experience and knowledge in the field of hydropower generation.
Out of 8 global players in the hydro market 4 new ones were formed:

- ABB + Alstom,
- GE + Kvaerner,
- Voith + Siemens,
- VA TECH HYDRO + Sulzer

The merger of 2000 and the market positions today

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1) Source: VA TECH Hydro
Andritz VA TECH HYDRO today: global operations

Employees per region
Total ~ 3,000

- China 9%
- Asia 14%
- S-America 3%
- N-America 5%
- Europe 69%

- Andritz VA TECH HYDRO locations incl. manufacturing
- Andritz VA TECH HYDRO locations
- History of VA TECH HYDRO

- Andritz VA TECH HYDRO
  - Business segments
  - Integration of VA TECH HYDRO

- Summary
### Five business segments

<table>
<thead>
<tr>
<th>Central Functions</th>
<th>Large Hydro</th>
<th>Hydro Service</th>
<th>Compact Hydro</th>
<th>Pumps</th>
<th>Generator Turbo</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Central Functions" /></td>
<td><img src="image2.png" alt="Large Hydro" /></td>
<td><img src="image3.png" alt="Hydro Service" /></td>
<td><img src="image4.png" alt="Compact Hydro" /></td>
<td><img src="image5.png" alt="Pumps" /></td>
<td><img src="image6.png" alt="Generator Turbo" /></td>
</tr>
</tbody>
</table>
Large Hydro

Shiwa Tidal Power Plant / Korea

WORLD’S LARGEST TIDAL POWER PLANT
Large Hydro: overview

- Large Hydro contributes **approx. 45 %** to the Hydro Power Business Area’s Sales:
  - Electro-mechanical packages (85% of Sales)
  - Product business: turbines, generators, penstocks & gates, shut off devices, balance of plant, automation, control, protection (15% of Sales)
Large Hydro: Orders under implementation

- PdF II & Gogosou / RO
- Karahnjukar / IS
- Lower Olt River / RO
- Dolna Arda / BG
- Tsankov Kamak / BG
- Ermenek / TR
- Borcka / TR
- Grand Coulee / US
- Rock Island / US
- Glendoe / GB
- Hintermuhr / AT
- Limberg II / AT
- Upper Gotvand / IR
- Beles / ET
- Lower Olt River / RO
- Kops II / AT
- Nestil / CH
- Allai Khwar / PK
- Varahi / IN
- New Naga Hammadi / EG
- Capim Branco / BR
- Walter F. George / US
- Tong Bai / CN
- Sihwa Tidal / KR
- Lang Ya Shan / CN
- Teesta LD III / IN
- Allai Khwar / PK
- Varahi / IN
-<br>
- > 20 MEUR
- > 50 MEUR
- > 100 MEUR
First joint implementation project based on stipulations by the Kyoto Protocol:

- Order volume: 200 MEUR; start-up in 2007
- One new plant and refurbishment of existing River-Vacha cascade
- Greenhouse gas reduction potential of this project: 200,000t CO₂ p.a.
- Joint implementation certificates will be bought by the Austrian Government
- Improvement of water management
- Additional work for 500 people during construction period
- Increased social standards
Large Hydro: Full liner strategy

Overview

- Gate
- Penstock
- Valve
- Hydro turbine
- Hydro generator
- Automation, control, protection and excitation

- Gate
- Penstock
- Valve
- Hydro turbine
- Hydro generator
- Automation
Large Hydro: Focussed strategy

Market strategy – selective project approach
- Market/Customer access
- Risk assessment
- Innovative Solutions

Manufacturing strategy
- Risk mitigation due to in-house production of core components

Project execution
- Focus on project management

Attractive hit rate

Positive development of project gross profit
Large Hydro: Innovation HYDROMATRIX®

HYDROMATRIX® technology

Turbine generator unit

HYDROMATRIX® benefits:
- Installation in existing civil structures (i.e. dams for irrigation)
- Add on renewable energy generation
- Low costs due to no additional civil works
- Standardised modular concept with high availability

Reference projects

Colebrook (USA)  Freudenau (Austria)  Jebel Aulia (Sudan)  Agonitz (Austria)  Nussdorf (Austria)
Hydro Service

Analysis

Diagnosis

Therapy
Hydro Service: Overview

Hydro Service contributes approx. 25% to the Hydro Power Business Area’s Sales:

- General overhaul/repair
- Upgrading/modernization
- Automation and control
- Monitoring and diagnosis systems

Hydro Service

Rehab

Service

- Plant assessment
- Maintenance services
- Spare parts services
- Trouble shooting, emergency repairs
- Field services, training
Hydro Service: Strategy

- Achieve and maintain #1 position in the home markets
- Establish and grow business in the defined target markets, such as USA, Bulgaria, and Turkey
- Focus is on services, and on small and medium size modernisation projects
- Specific attention is on servicing the own installed fleet worldwide
Compact Hydro
Compact Hydro: Overview

Compact Hydro contributes approx. 10 % to the Hydro Power Business Area‘s Sales

**Compact Hydro**

- Water-to-Wire packages for small and medium-sized hydroelectric power plants up to an output of 15 MW:
  - Turbines
  - Valves
  - Generators
  - Governors
  - Automation, control, protection
  - Transformers
  - Installation
  - Testing and commissioning
  - Training of operators

**Compact Hydro benefits:**

- Decentralised renewable power generation
- European and international subsidy programmes to promote renewable energy
- Standardised modules for fast implementation
Compact Hydro: business features

- Trend towards small, environmentally friendly hydro power plants

- New drivers are green energy bonus and Kyoto protocol

- Innovative solutions with low overall investment and fast implementation
Compact Hydro: Innovation ECOBulb®

**Description**

- Bulb type unit up to 5 MW with direct driven generator
- Environmentally friendly solution (reduction of noise, reduction of oil pollution risk)
- Overall economical solution by reduction of the civil work costs

**Benefits**

- Low investment costs
- Low operating costs
- No step-up gear – so no oil!

Less environmental impact and high efficiency

**Reference projects**

- 2002 Aubas, (F): 300 kW
- 2004 Paullo, (IT): 2 x 1,100 kW
- 2004 Sonoco, (CA): 2 x 3,900 kW
- 2004 Tombetta, (IT): 4 x 1,400 kW
- 2005 Genivolta, (IT): 1,150 kW

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Pumps
Pumps: Overview

Pumps contribute approx. 10 % to the Hydro Power Business Area’s Sales

- Large Scale Pumps
  - for thermal power stations
  - for irrigation plants
  - for water supply systems

- Centrifugal Pumps
  - for the pulp & paper industry
  - for thermal power plants

Double suction type pump for water supply systems

Centrifugal pump for the pulp & paper industry

Cooling water pump for thermal power stations
Generator Turbo

Generator Turbo contributes approx. 10 % to the Hydro Power Business Area’s Sales
### Generator Turbo: Overview

<table>
<thead>
<tr>
<th>Description</th>
<th>Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production of air-cooled turbo generators from 50 up to 175 MVA for GE gas turbine; manufactured at site in Weiz, Austria</td>
<td><img src="image1.jpg" alt="Image of turbo generator" /></td>
</tr>
<tr>
<td>Turbo generators are used in gas-combined-cycle power plants and combined heat-and-power stations</td>
<td><img src="image2.jpg" alt="Image of turbo generator" /></td>
</tr>
</tbody>
</table>

Turbo generators with a total output of about 5,000 MVA are delivered every year.
Turbo generator

Thermal cycle

- Exhaust gases
- Steam turbine
- Boiler
- Gas turbine
- Gas
- Condenser
- Turbo generator

Highlights

- VA TECH HYDRO is the major manufacturer of GE of air-cooled turbo generators which are based on GE technology and have been partly co-developed by both partners.

- Since 1991 we have shipped more than 250 units with a combined output of 25,000 MVA.
- History of VA TECH HYDRO
- Andritz VA TECH HYDRO
  - Business segments
  - Integration of VA TECH HYDRO
- Summary
Integration of VA TECH HYDRO into the Andritz Group focuses on three different areas:

- Markets
- Products
- Cross Functions
Integration of VA TECH Hydro: Markets

Existing overlaps:
- Service business for Austria and Germany
- Large Hydro core component business in China

Status of integration:
- Service business for Austria directed from Graz location (former HM Business Area)
- German market is served by Ravensburg (VA TECH HYDRO)
- Chinese market will be served by both VA TECH HYDRO Beijing as well as ATC (Andritz Technologies China) in Foshan. Key account approach will be followed.
Potential synergies: Andritz/Andritz VA Tech Hydro

Northern Europe:
- Waplans: Andritz share 40%, ~ 80 employees
- Strong Andritz position in Pulp and Paper, but also in Hydro service

Good coverage for service of Austrian market (Graz & Weiz)

Switzerland:
- Strong Andritz position with Andritz Technologies China
- JV Andritz Kenflo
- Selectively expand Hydro Power activities

China:
- Strong Andritz position with
  - Andritz Technologies China
  - JV Andritz Kenflo
  - Selectively expand Hydro Power activities

Brazil:
- Strong Andritz position with sites and workshops in
  - Pomerode: 100 employees
  - Curitiba: 100 employees
  - Pilao: 100 employees
- Expand local manufacturing serving all Andritz SBAs
- Strengthen VA TECH HYDRO’s market position

India:
- Strong position of VA TECH HYDRO with 500 employees
- Leverage other Andritz businesses
- Fully expand market position of Andritz VA TECH HYDRO

Austria

Sweden / Finland

India

China
Integration of VA TECH HYDRO: Products

- The entire product range of VA TECH HYDRO and Andritz HM will be integrated into the Hydro Power Business Area.

- All activities for “small turbines” so far handled by Andritz Graz will be integrated into the Compact Hydro Division of VA TECH HYDRO (CoC Grenoble and Ravensburg).

- Graz will remain the Center of Competence for all types of pumps (except pump turbines).
Integration of VA TECH HYDRO: Cross Functions

- **R&D**
  Andritz HM will be fully integrated into the VA TECH HYDRO’s R&D program

- **Engineering**
  Harmonization of all computation and design (CAD) tools and software

- **Organizational integration**
  Integration has been progressing as planned since June 1, 2006; completion expected by end of 2006

- **Controlling and Accounting**
  Will be fully harmonized by end of Q3 2006 and will remain under well-established VA TECH HYDRO management
Integration of VA TECH HYDRO: Improvement projects

Part of the integration process is also to identify and address areas with improvement potential; the following projects have been initiated:

- Competitiveness of Hydro generator business
- Market and manufacturing strategies for India
  - Legal and organizational integration of the organizations in Bhopal and Faridabad
  - Expansion strategy
  - Integration into the international manufacturing and engineering network
- Establish business model for Brazil
- Profitability of Compact Hydro in certain markets (Canada, Brazil, India)
- Optimization of layout and make/buy strategy of the generator workshop in Weiz, Austria
- History of VA TECH HYDRO
- Andritz VA TECH HYDRO
  - Business segments
  - Integration of VA TECH HYDRO
- Summary
Hydro Power in general is the most developed and feasible renewable energy with highly proven technology supporting the Kyoto target.

Andritz VA TECH HYDRO …

- … takes advantage of continuous market growth for investments in the electrical power industry
- … is well positioned as one of the top players in the global hydro market with a leading position in Europe; main competitors are Alstom, Voith Siemens and GE Hydro
- … has a long lasting experience in the hydro power business with a large number of references
- … has a selective approach to profitable new large hydro projects and a leadership position for small hydro projects and for refurbishment/services
- … develops sustainable and innovative technologies, products and services for turnkey electromechanical equipment and automation
- … is strongly focussing on innovative development of projects together with our customers
The first 100 days in the new environment have shown that both customers and employees welcome the new structure and that our business development continues successfully.

Integration is also proceeding well due to our staff’s full commitment.

We are well positioned for new, future challenges.
Andritz VA TECH HYDRO
Your partner for renewable and clean energy!

Thank you very much!