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**Waterpower XIV, Austin Texas, July 18-25 2005:**  
***Development in the Americas: What's the  
Potential, and What's Being Built?***

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## *World Hydropower Supply and Potential*

- **Hydropower supplies about 2 800 TWh – 17% of world electricity consumption**
- **Installed capacity 740 GW**
- **Renewed determination & urgency for development**
- **118 GW under construction in 100 countries**
- **Global potential:**
  - ❖ **Presently 20% developed**
  - ❖ **Technical potential 14 500 TWh**
  - ❖ **Present economic potential 8 100 TWh**

## *The Americas – Total Hydropower Supply and Potential*

- **Hydropower supplies about 1 250 TWh**
- **Installed capacity 280 GW provides 45% of world's hydroelectric energy**
- **Technically feasible potential 4 800 TWh**
  - ❖ **40% developed in North America and Central America, which have 12% of the global potential**
  - ❖ **20% developed in South America, which has 20% of the global potential**
- **Economic potential 2 600 TWh**
- **Planned Capacity:**
  - ❖ **17 GW North America and Central America**
  - ❖ **57 GW South America**

## *The Americas - Recent Growth*

- **1999 to 2004: capacity in service increased >3% in North America and Central America; >14% in South America**
- **Will trend continue?**
- **Opportunities, challenges, solutions?**
- **Special factors to consider:**
  - ❖ **Environmental and social impacts now dominate in many projects throughout region**
  - ❖ **GHG emissions reductions important as a benefit, also as an impact on hydrology**
  - ❖ **Diminishing oil and gas reserves, and rising cost of fossil fuels**
  - ❖ **Renewables growth (including hydropower) driven by Kyoto Protocol, emissions trading, RPS, tax credits, and incentives**

## *USA – Opportunities and Challenges*

- **Installed capacity >100 GW, 76 GW conventional - supply 10% of US electricity**
- **Potential up to 170 GW - 21 GW at existing dams, 4.3 GW at existing generating facilities**
- **However, little new capacity is being added**
- **Main reasons:**
  - ❖ **High capital cost and long lead time**
  - ❖ **Onerous regulatory burden**
  - ❖ **Failure to recognize benefits, low R&D, lack of incentives**
- **Other factors:**
  - ❖ **Mature system, short-term overcapacity**
  - ❖ **Dominance of fossil, emergence of other renewables**

## **USA - Actions**

- **Licensing reform – be more efficient, shorter, simpler**
  - ❖ **Relicensing takes up to 25 years; average 8 to 10 years (contrast with CCGT at 1 to 3 years)**
  - ❖ **Loss of energy production (1.6% to 4% or more)**
  - ❖ **Major challenge over next decade: 300 projects, >30 GW, 39 states**
- **Policies to encourage development at existing sites**
- **Funding for R&D**
- **Financial incentives (e.g. Energy Policy Act of 2005, PTC)**
- **Industry must apply new knowledge and communicate effectively**

## *Canada – Opportunities and Challenges*

- **World's leading producer – 69 GW, 475 plants, 350 TWh/year (60% of national supply)**
- **Potential 118 GW**
- **Presently 15 major projects (10 GW) under construction or in planning**
- **Positive outlook, but challenges:**
  - ❖ **Increasing regulatory requirements**
  - ❖ **Long lead times and high capital costs**
  - ❖ **Reluctance to recognize all advantages of hydropower**

## *Canada – Actions*

- **Streamline and coordinate the approvals and regulatory processes**
- **Educate and influence government, ENGOs, and public about impacts and benefits of hydropower**
- **Provide fiscal incentives (RPS, tax holidays, tax credits, green credit programs)**
- **Develop a national renewables strategy that will include hydropower**

## *Mexico*

- **Mexican electricity consumption growing at 6% per year, and 28 GW needed by 2012 to cover load growth and retirements**
- **11.5 GW of hydroelectric capacity supplies up to 20% of total load**
- **50 GW of hydroelectric potential**
- **Approximately 4 800 MW hydropower planned and 700 MW under construction**
- **Most new generation will be gas-fired, and hydro development is not a priority**
- **Slow progress in opening power development to private capital, likely until after 2006**

## *Central America*

- **Central America has outstanding potential for hydropower development**
- **Costa Rica, Nicaragua, Guatemala, Panama, and Honduras are especially active**
- **Installed hydropower capacity is 16 GW, up 11% in five years.**
- **Central American countries plan to build 10 GW of new hydroelectric capacity.**
- **Many opportunities for large-scale and small hydro in the region**

## *South America - General*

- **Estimated \$70 billion investment in South American power sector to support economic growth over next 10 years**
- **Enormous potential (>2 800 TWh); 1 600 TWh now economic**
- **Installed capacity has grown by 14% over last five years**
- **Excellent resources and opportunities**
- **However, development has been constrained by lack of financing, political or regulatory uncertainty, and concerns about dependence on one source of generation**

## *South America - Markets*

- **Development historically vested in government-owned entities**
- **Electricity markets (3) emerged in 1990s**
- **First stage wholesale spot market, utilities privatized, initial success**
- **Spot market proved too volatile to signal investment, especially in hydroelectric system**
- **Second stage of reform has bilateral contracts backed by firm capacity**
- **Good environment for hydropower development**
- **Some uncertainty remains (e.g. government is moving back into the power sector in Argentina)**

## *Brazil - Background*

- **Brazil has strong, growing economy, vast hydroelectric resources, and highest energy consumption in South America**
- **Total generating capacity 91 GW, 85% hydropower**
- **Market reforms beginning 1996, unbundling, competition, spot market concept**
- **After crisis and rationing in 2001, Brazil realized that structural change and diversity were needed**
- **Power supply now arranged through PPAs at auction**
- **Overcapacity until 2008; assuming 4% growth in GDO, new capacity requirement 3.5 GW/year after 2008**

## *Brazil - Potential*

- **Estimates of potential hydropower development range from 145 GW to 226 GW**
- **11 GW under construction, and 25 GW planned**
- **2.5 GW small hydro potential (<30 MW each)**
- **Ten plants (total 2.5 GW) on-line in 2005, 15 more (total 4.8 GW) under construction, and government is seeking bids for a further 17 plants (total 2.8 GW)**
- **Brazil is encouraging renewables (3.3 GW, 1/3 small hydro) through PROINFA, with goal of 10% in supply mix in 20 years**

## *Challenges for Latin America*

- **Development in Latin America is driven by rapid growth of the regional economies**
- **Hydropower will be a key resource in most countries, which will face the same challenges and need for actions as in the USA and Canada**
- **Additional needs:**
  - ❖ **Stable political and economic conditions for private investment (from inside and outside)**
  - ❖ **Transparent, equitable regulatory system**
  - ❖ **Markets to support long-term investment in hydropower**
  - ❖ **Appropriate financing strategies and mechanisms**
  - ❖ **Consistent principles for sustainable development**
  - ❖ **Adequate transmission and distribution systems**

## *Conclusions*

- **The Americas face the need to develop their renewable energy options**
- **The Americas are endowed with large potential and excellent opportunities to develop hydropower resources**
- **Challenges and problems are well known, and can be resolved**
- **There are clear signs that governments and developers are recognizing and acting on these issues**
- **Diligence is required, and we may be optimistic about the future of hydropower development**