

# CARLOS ENRIQUE WARHMANN BRENES

## 30+ years of Hydro Electric & Wind Expertise

### Academic Background

Professional Degree: Electrical Engineer

Academic Degree: Graduate School in Universidad de Costa Rica in Power System.

Training in: México Instituto de Investigaciones Eléctricas (Control Systems), in Comisión Federal de Electricidad (Geothermal power plants, Cerro Prieto and Los Azufres), Brasil (Eletrobras, Furnas, Light companies, Control and protection systems for HPP and substations). On the job training in Japan (Toshiba, Hitachi, Fuji, Marubeni Corporation, West Japan Engineering Consultants), Sweden (ABB), Argentina (Pescarmona), Canada (ABB), Chile (Endesa), Brasil (Villares).

### Profesional Experience

Prefeasibility, Feasibility Studies, Basic and Final Designs for Hydro Power and Wind Energy Plants. Due Diligence for Hydro Power and Wind Energy Plants. Construction supervision for Hydro Power and Wind Energy Plants. Bid Documents preparation for acquisition of Hydro Power and Wind Energy Equipments. Offer's study and awarding for Hydro Power and Wind Energy Equipment.

### Project Experience

#### Costa Rica:

- Electrical system erection (partial) and commissioning for Río Volcán HPP (Enel, 1x17 MW, Pelton).
- Prefeasibility for La Ventolera Wind Farm (Jasec, 3.5 MW).
- Feasibility Study for Mogote Guayabo Wind Farms (Venfor and Fila de Mogote, 40 MW).
- Preparation of technical and field information to request the Environmental Impact Assessment for Guayabo and Mogote Wind Farms (40 MW).
- Construction supervision for El General Hydro power plant, (Hidroenergía del General, 2 Francis turbines 20 MW each).
- Due diligence Movasa Wind Farm (Enel, 20 MW).
- Due diligence for La Esperanza HPP (Private owner, 5 MW).
- Prefeasibility study for Tenorio I HPP (1x7 MW, francis horizontal).
- Fatal Flaws analysis for various hydroelectric projects, identified by Ingenierías AWA, S.A. for Hunt Energy Horizons, such as: Banano, 10 MW; Corinto, 12 MW; Guadalajara, 6 MW; Limón, 9 MW; Tabla, 39 MW; Ceibo, 13 MW; Convento, 20 MW; Volcán, 20 MW, Sardinal 11 MW.

### **Guatemala:**

- Electrical Stability Analysis (Together with Acres (Hatch) from Canada) for thermal generation power barges, Puerto Quetzal, (PQP, 236 MW).
- Feasibility Study for Hidroeléctrica Tres Ríos (H3R, 50 MW, 3 plants in a cascade arrangement).
- Feasibility, Basic and Final Design, Bid Documents and Electromechanical Equipment awarding for La Perla HPP (CAVC, 1x4 MW, pelton).
- Feasibility, Basic Design, Bid Documents, Civil works, W2W, Interconnection awarding for San Cristóbal HPP (Duke Energy, 2x11 kW, francis horizontal).
- Prefeasibility study for Esmeralda HPP (Hidroeléctrica La Esmeralda, 2x11 MW, pelton horizontal).
- Prefeasibility, Feasibility and Basic Design, Bid Documents and Technical Specs preparation. Offer study and awarding recommendation for Civil works, W2W and Electrical Interconnection for Santa Rita HPP, (Inver Hidro and Mesoamérica Energy, 2x12 MW, "S" type kaplan).
- Prefeasibility study for Las Brisas (Inver Hidro, 3x12 MW, francis horizontal).
- Fatal Flaws analysis for two hydroelectric projects, for Mesoamérica Energy: Cahabón, 40-60 MW; Volcán 2: 25 MW.

### **Chile:**

Fatal Flaws analysis for Hunt Energy Horizons of various hydroelectric Projects, such as: Carilafquén, 17 MW; Malalcahuello, 7 MW; Bureo, 20 MW; Colorado, 14 MW; Cumpeo, 4 MW; La Compañía, 3 MW; Melo, 3 MW.

### **Panamá:**

Fatal Flaws analysis for Hunt Energy Horizons for Huaca HPP, 5 MW.

### **Nicaragua**

- Preliminary design for the transmission line for Pantasma HPP, 13 MW.
- Stability analysis of the national grid to determine the possibility for the interconnection of El Bote HPP, 900 kW.

### **México**

Fatal Flaws analysis for Escalona HPP, (8 MW).