

TECH-6: Curriculum Vitae (CV) for Proposed Professional Staff

1. **Proposed Position:**

2. **Name of Firm:** Studio Ing. G. Pietrangeli s.r.l.

3. **Name of Staff:** **Antonio BRASCA**

4. **Date of Birth:** 01-04-1969 **Nationality:** Italian

5. **Education:** MSc in Civil & Hydraulic Engineering, University of Rome "La Sapienza", 1997

6. **Membership of Professional Associations:**

Italian Consulting Engineers Register of Rome, since 1997

7. **Other Training:**

Lecturer on Dams and Hydropower Development, Continuing Professional Education (CPE), Italian Consulting Engineers Register of Rome, 2014/2015

Various technical specialization courses, among which:

- Dams and Hydropower Development, Italian Consulting Engineers Register of Rome, 2014/2015

8. **Countries of Work Experience:** Albania, Bulgaria, Burundi, Congo, Ecuador, Eritrea, Ethiopia, Kenya, Italy, Nigeria, Rwanda, Sierra Leone, Tanzania, Turkey, Uganda, Zambia.

9. **Languages:**

	<i>Speaking</i>	<i>Reading</i>	<i>Writing</i>
English	Excellent	Excellent	Excellent
French	Fair	Good	Fair
Spanish	Fair	Good	Fair
Italian	Mother Tongue		

10. **Employment Record:**

From: 1997 To: date
Employer: Studio Ing. G. Pietrangeli s.r.l.
Positions held:

11. **Detailed Tasks Assigned**

12. **Work Undertaken that Best Illustrates Capability to Handle the Tasks Assigned:**

BATOKA GORGE Hydro-Electric Scheme

Year: 2014 – in progress

Location: Zambia and Zimbabwe

Client: Zambezi River Authority

Main project features: Batoka Gorge (IP = 1600 MW) is a hydropower plant located on the Zambesi River between Victoria Falls and the existing Lake Kariba. The project is a trans-boundary plant having the following basic features:

- Batoka Dam (RCC Arch-Gravity Dam, H = 181 m, Crest Length = 767 m, Concrete volume V = 4 Mm3)
- Spillway (Q= 20.000 m3/s, Radial gated on dam crest, No. 7 gates 14x13 m)
- Headrace Tunnels (No. 4 (2+2) , D = 8,9 m, L = 250---450 m)
- Penstock Shaft (No. 4, D = 7 m, L = 120 m)
- Power House (No. 2, underground type, No. 4x2 Francis Turbines, Q = 1000 m3/s, IP = 1600 MW)
- Transmission Lines (L = 200 km - 330 kV in Zambia, L=140 km 420 kV in Zimbabwe)

Position held:

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Activities performed: Pre-feasibility study (Confirmation of scheme layout), Feasibility Study, Tender Design, Tender Documents

LUFUBU HPPs Cascade

Year: 2013 – in progress

Location: Zambia

Client: LPC Lufubu Power Company Ltd.

Main project features: LUFUBU HPP Cascade envisages the construction of three hydropower plants on the Lufubu River with a total installed capacity of 325 MW (energy annual production 1336 GWh/y). The Main Works are the following:

LUFUBU 1 – IP = 130 MW

- Reservoir (Total volume = 400 Mm³)
- Dam (RCC type, H = 65 m, Crest L = 2530 m)
- Headrace Canal (L = 2.4 km)
- Penstock (L = 2.7 km D = 4.2 m)
- Power house (Open air type, 2 Francis Turbines IP = 2X65 MW)
- Transmission line (132 kV, L = 50 km)

LUFUBU 2 – IP = 100 MW

- Reservoir (Total volume = 58 Mm³)
- Dam (RCC type, H = 17 m, Crest L = 625 m)
- Headrace canal (L = 6.6 km)
- Penstock (L = 0.6 km D = 3.8 m)
- Power house (Open air type, 2 Francis Turbines: IP = 2X50 MW)

LUFUBU 3 – IP = 95 MW

- Reservoir (Total volume = 121 Mm³)
- Dam (RCC type, H = 33 m, Crest L = 960 m)
- Headrace Canal (Length = 8 km)
- Penstock (L = 1.5 km D = 4.5 m)
- Power house (Open air type, 2 Francis Turbines IP = 2X47.5 MW)
- Transmission line (330 kV, L = 220 km)

Position held:

Activities performed: Conceptual scheme, Feasibility, Final/Detailed Design and tender documents, Environmental and Social Impact Assessment, Supervision of construction

MONTEDOGLIO Dam Rehabilitation

Year: 2013 – 2014

Location: Italy

Client: IMPREPAR S.p.A. (Impregilo Group)

Main project features: Montedoglio dam has suffered some damages at the spillway and dam body due to a large flood occurred in 2010.

SP has been appointed to carry out the assessment of the current conditions and the design of the refurbishment works to restore the complete functionality of the structures. The main characteristics of the project are the following:

- Reservoir (Total storage 168 Mm³)
- Main Dam (Earthfill type, H = 64.30 m, L = 566 m, Emb. Volume 2.7 Mm³)
- Secondary Dam (Earthfill type, H = 8.6 m, L = 288 m, Emb. Volume 0.04 Mm³)
- Spillway (Q=909 m³/s, side spillway ungated L=112 m + n° 2 gates L = 24 m)

Position held:

Activities performed: Assessment of the damages occurred, assessment of the conditions of the dam, survey, investigations, feasibility and final design of the rehabilitation works, supervision of construction of the rehabilitation works

LOWER DIAMPHWE Multipurpose Dam. Water Supply and Irrigation Scheme.

Year: 2013 – in progress

Location: Malawi

Client: Ministry of Water Development and Irrigation, Malawi

Main project features: Lower Diamphwe dam and associated structures (water supply and irrigation scheme) including the following works:

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- Lower Diamphwe Dam (Rockfill type, H = 28 m, L = 450)
- Saddle Dam (Type = Rockfill with clay core, H = 6.6 m)
- Spillway (Overflowing type, Q = 1350 m³/s, L_{sill} = 218 m)
- Culverts (n°2, Q = 145 m³/s, L = 20 m)
- Water Intake (Water supply gate = 1.4 x 1.4 m, Irrigation gate = 0.8 x 0.8 m)
- Pipeline (L = 40 km, D = 1100 – 1500 mm)
- Irrigation Scheme (approx. A = 1,000 Ha)

Position held:

Activities performed: Review and upgrade of feasibility studies, Detailed Design, tender documents

GUAYLLABAMBA HPPs: Cuenca alta (310MW), Cuenca media y baja (1,160MW)

Year: 2012 – 2013

Location: Ecuador

Client: Instituto Nacional de Preinversión

Main project features: The Cuenca Alta includes San Pedro HPP (50 MW) :

- Gravity Dam (H = 50 m, L = 100 m, V = 50.000 m³)
 - Underground power house (No.2 Francis turbines, Rated Power 50 MW)
- together with the downstream plant Calderón+Cubi (260 MW):
- Gravity Dam (H = 115 m, L = 192 m, V = 320.000 m³)
 - Underground power house (No.4 Pelton turbines, IP = 260 MW)

The “Cuenca media y baja” includes : Chespi (468 MW), Chontal (194 MW), Chirapi (157,5 MW), Manduriacu (60 MW), Tortugo (201 MW), Tigre (80 MW)

Position held:

Activities performed: Cuenca Alta: Investigations, Prefeasibility study; Cuenca Media y baja: Optimization of existing projects, Master Plan

NAMAKHVANI HPP Cascade (Tvishi + Namakhvani + Zhoneti, IP_{tot} = 450 MW)

Year: 2012 – in progress

Location: Georgia

Client: JSC Namakhvani hpp Cascade

Main project features: The project envisages the construction under an EPC contract of three hydropower projects with the following basic features :

Tvishi:

- CVC gravity dam (H = 56.5 m, L = 100 m, V_{res} = 13.1 Mm³)
- Open air Power house (No. 2 Kaplan turbines, IP = 2x50 MW)

Namakvani:

- Concrete arch dam (H = 111.0 m, L = 315 m, V_{res} = 156 Mm³)
- Open air Power house (No. 3 Francis turbines, IP = 3x85 MW)

Zhoneti:

- Rockfill dam with bituminous core (H = 31 m, L = 174 m, V_{res} = 12.5 Mm³)
- Open air Power house (No. 2 Kaplan turbines, IP = 2x50 MW)

Position held:

Activities performed: Review and Upgrade of Feasibility Study, Tender Documents, Consultancy for Tender, Assistance during procurement, Supervision of Construction

RUZIZI transmission lines and dams rehabilitation

Year: 2012 – 2014

Location: Congo, Burundi and Rwanda

Client: Organisation pour l'Énergie des pays des grand Lacs, Union Européenne

Main project features: The main components of the projects are :

- Kamanyola Station and National Dispatching Centre
 - Cascade Coordination Centre
 - Transmission Line (N°2, L_{TOT} = 100 Km, 220 kV)
 - Rehabilitation and upgrading of Ruzizi I and Ruzizi II
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- Ruzizi I Gravity Dam (H=15m, L=195m), Outdoor PH (N°4 Kaplan, IP=29.8 MW)
- Ruzizi II Gravity Dam (H=14 m, L=85m), Outdoor PH (N°3 Francis, IP=44 MW)

Position held:

Activities performed: Feasibility Study, Final Design, Tender Documents, ESIA of Kamanyola Station, Transmission Lines, and Cascade Coordination Centre. Investigations, Design and studies of rehabilitation works for the Dams

MITA HILLS dam refurbishment and upgrading

Year: 2011 – 2012

Location: Zambia

Client: Lunsenfwa Hydropower Company

Main project features: The upgrade of the existing Mita Hills dam (Earthfill/Rockfill, H = 40m, L=330m) includes what follows to increase the reservoir volume and for refurbishment:

- Current set-up / proposed set-up :
 - Reservoir ($V_{RES} = 680 \text{ Mm}^3$ / $V_{RES} = 850 \text{ Mm}^3$)
 - Spillway (N°2 gates 9x9 m, N°2 erodible fill embankments L = 20 m / N°2 gates 10x12 m, N°1 emergency fuse gate L = 40m)
- Intake Tower (H=80 m, N° 2 Radial Gates)

Position held:

Activities performed: Assessment of the Existing Plant, Pre-Feasibility Studies, Feasibility Design for the refurbishment and upgrading

RUMAKALI Hydroelectric Power Plant (IP = 525 MW)

Year: 2011 – 2013

Location: Tanzania

Client: Zarubezhstroy Ojsc; Beneficiary: Ministry of Energy and Minerals

Main project features: Hydroelectric Power Plant including the following works :

- Rumakali Dam (H= 90m, BFRD type)
- North Site main Dam (H = 63 m, BFRD type)
- East Site main Dam (H = 44 m, BFRD type)
- Underground Power House (WxLxH = 180 x 23 x 44 m, Design Head = 1,423 m, Q = 42 m³/s, N°4 Turbines Pelton)
- Transmission line (Voltage 220 Kv, Total Length = 70 Km)

Position held:

Activities performed: Conceptual Scheme, Feasibility Design, BOT Contract documents

GRAND ETHIOPIAN RENAISSANCE Hydroelectric Power Plant (IP = 6,000 MW)

Year: 2010 – in progress

Location: Ethiopia

Client: Salini Costruttori S.p.A.; Beneficiary : EEPKO

Main project features: The hydroelectric power plant (IP = 6,000 MW) includes:

- Reservoir ($V_{RES} = 63,000 \text{ Mm}^3$)
- Main dam (Gravity RCC type, H = 155 m, L = 1,780 m)
- Saddle dam (Rockfill dam type, H = 45 m, L = 4,800 m)
- Spillway (No. 6 gates 14x15.5 m, Q = 10,500 m³/s)
- Power Waterways (Penstocks No 15, L= 180 m, D = 8.5 m)
- Diversion culverts (N°4, L=210 m, D = 8 m, Diversion Flood = 3,000 m³/s)
- Powerhouses (No. 2, Outdoor, Q=1,550m³/s, Design Head=135 m, N°10+6 Francis Turbines, Energy production = 15700 GWh/year)
- Switchyard (No. 2, No. 15 bays 400 kV, No. 15+30 transf. 20/400 kV)
- Bridge (L =260 m, W = 10 m, Max span length = 72 m, Piers No 6)

Position held:

Activities performed: Feasibility study, Basic Design, Final Design (Level 1), Construction Design (Level 2), Supervision of Construction for the EPC Contractor

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KIDUNDA dam for water supply, irrigation and hydropower (IP = 20 MW)

Year: 2010 – in progress

Location: Tanzania

Client: Dar es Salaam Water & Sewage Authority (DAWASA)

Main project features: Dam project for irrigation, water supply and hydropower purposes including the following works:

- Reservoir (C.A. = 78 Km², Live Storage = 280 Mm³)
- Dam (Bituminous Facing Rockfill Dam type, H=21 m, L= 860 m)
- Spillway (Gated type, L = 133 m, Gates N° 8, Q = 3,500 m³/s)
- Intake Tower (H = 25 m, Slide gates N° 4, 6x6 m)
- Outdoor Power House (IP = 20 MW, Kaplan turbines N° 2, E = 60 GWh/y)

Position held:

Activities performed: Topographical Survey and GIS of Dar es Salaam area, Feasibility study, Final Design, Environmental and Social Impact Assessment

MUCHINGA Hydropower Plant (IP = 255 MW)

Year: 2010 - 2012

Location: Zambia

Client: Muchinga Power Company

Main project features: Hydropower project (IP = 255 MW) exploiting the waters regulated by the existing Mita Hills dam, including the following works:

- Mkushi Dam (Arch type, H = 120 m, L = 350 m)
- N°2 Power Tunnels (L= 9+8 km, D = 5)
- Penstocks (N°3, D = 2.2 m, L = 1,000 m)
- Power House: (Outdoor, N° 3 x 85MW Pelton Turbines)

Position held:

Activities performed: Conceptual Design, Feasibility study (up to investigations)

SIGOR WEI WEI Phase III

Year: 2009 – in progress

Location: Kenya

Client: Kerio Valley Development Authority

Main project features: The Project's main goal is to substantially ameliorate the living conditions of the rural population in the Kenyan arid and semi arid areas (ASAL) through:

- Irrigation (Net irrigation area = 600 ha) :
- Main distribution pipeline (D = 450 – 400 mm, L = 360m)
- Secondary distribution pipeline (L = 15 km)
- Tertiary distribution pipeline (L = 14 km)
- Field irrigation pipe (Steel galvanized pipe, D = 60mm)

Position held:

Activities performed: Feasibility Study, Detailed Design, Environmental Impact Assessment (EIA), Tender Documents, Supervision of Construction (on going)

GIBE V Hydroelectric Power Plant (IP = 660 MW)

Year: 2008 - 2009

Location: Ethiopia

Client: Salini Costruttori S.p.A.; Beneficiary : EEPKO

Main project features: Gibe V (IP = 660 MW) is the 5th stage of the Gibe-Omo cascade and includes the following works :

- RCC Gravity Dam (H = 78 m, L = 580 m)
 - Gated Spillway (N°10 gates, Dimensions 12x19 m)
 - River Diversions Works (N°2 culverts, D= 12 m, L=240 m)
 - Cofferdam (Rockfill, H = 20 m, L = 240 m)
 - Outdoor Power House (N° 10 Francis turbines, IP = 10x66 MW)
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Position held:

Activities performed: Reconnaissance Project, Feasibility Study

GIBE IV Hydroelectric Power Plant (IP = 1,480 MW)

Year: 2008 - 2009

Location: Ethiopia

Client: Salini Costruttori S.p.A., Beneficiary : EEPCO

Main project features: Gibe IV (IP = 1,480 MW) is the 4th stage of the Gibe-Omo cascade and includes the following works :

- RCC Gravity Dam (H = 165 m, L = 725)
- Gated Spillway (N°9 radial gates, Dimen. 12x19, Q = 22,000 m³/s)
- Power Waterways (No 2, L = 0.8 km, D = 12 m)
- D/S Rockfill Cofferdam (H = 27 m, L = 117 m)
- Outdoor Power House (N°8x185 MW Francis turbines)

Position held:

Activities performed: Reconnaissance Project, Feasibility Study

KYOGA-NILE HPPs Cascade (Kamdini + Kibaa + Murchison, IP_tot = 6,010 MW)

Year: 2008 - 2009

Location: Uganda

Client: Salini Costruttori S.p.A.; Beneficiary: Ministry of Water and Environment

Main project features: The basic features of the cascade are the following.

Kamdini (Karuma) is the 1st plant of the Kyoga-Nile HPPs cascade and includes :

- Rockfill Dam (H = 30 m, L = 480 m, V_{res} = 68 Mm³)
- Headrace Canals (L = 5.7 km, Bottom width = 15 m)
- Tailrace Tunnels (N° 2, L = 4 km, D = 14 m)
- Underground PH (N°10 Francis turbines, IP = 1,260 MW, H_{net} = 64 m)

Kibaa is the 2nd plant of the Kyoga-Nile cascade and includes :

- Rockfill Dam (H = 53 m, L = 2,150 m, V_{res} = 300 Mm³)
- Headrace Canals (L = 10 km, Bottom width = 14 m)
- Tailrace Tunnels (N°2, L = 4.5 km, D = 14 m)
- Underground PH (N°16 Francis turbines, IP = 2,600 MW, H_{net} = 131 m)

Murchison is the 3th plant of the Kyoga-Nile cascade and includes :

- Rockfill Dam (H = 44 m, L = 1,300m, V_{res} = 170 Mm³)
- Headrace Canal (Bottom Width = 14 m; L = 0.7 km)
- Tailrace Tunnels (N° 2, L = 5.5 km, D = 14 m)
- Underground PH (N° 14 Francis Turbines, IP = 2,150 MW, H_{net} = 107 m)

Position held:

Activities performed: Pre-feasibility study, Feasibility study

MAMBILLA Hydroelectric Power Plant (IP = 4,000 MW)

Year: 2008 - 2009

Location: Nigeria

Client: Salini Costruttori S.p.A.

Main project features: The hydroelectric Power Plant includes the following works :

- Gembu Dam (RCC dam, H = 100 m, L = 515 m)
- Sumsum Dam (RCC dam, H = 35 m, L = 460 m)
- Nghu Dam (Rockfill dam, H = 95 m, L = 680 m)
- Water transfer Tunnel (L = 16 Km, D = 6 m)
- Headrace canal (L = 3.1 Km, Width = 15 m)
- Power Shaft (N° 16, D = 5.25 – 8.40 m, Total L = 1,000 m)
- Underground PHs (N°2, N°16 Turbines Pelton, Q = 88 m³/s, IP = 16x250 MW)

Position held:

Activities performed: Pre-Feasibility study, Feasibility study

BELES Multi-Purpose Project (IP = 460 MW)

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Year: 2005 - 2011

Location: Ethiopia

Client: Salini Costruttori S.p.A., Beneficiary: EEPKO

Main project features: Beles is a Multi-Purpose Project on Lake Tana for Hydroelectric purposes and irrigation. The main works of the project include :

- The use of the natural Lake Tana as reservoir (Total Storage = 32,270 Mm³)
- Intake (No. 5+2 bays, W = 43 m, Q = 160 m³/s)
- Headrace tunnel (L = 11 km, D = 8 m)
- Surge Shaft (L = 91 m, D = 18 m)
- Penstock Shaft (L = 286 m, D = 6.5 m)
- Underground Power House (Dimensions = 82x17x38 m, No. 4 Francis turbines, Design Head = 332 m, Design flow = 160 m³/s, IP = 4x115 MW)
- Transformer cavern (Dimensions 41x13x10 m, No. 4 OFWF transformers, 400/15 kVA)
- Tailrace tunnel (L = 7 km, D = 8 m)

Position held:

Activities performed: Feasibility study, Basic Design, Final design, Construction design, Consultancy during construction

GIBE III Hydroelectric Power Plant (IP = 1,870 MW)

Year: 2005 – in progress

Location: Ethiopia

Client: Salini Costruttori S.p.A., Beneficiary : Ethiopian Electric Power Corporation

Main project features: Gibe III (IP = 1,870 MW) is the 3rd stage of the Gibe-Omo cascade and will become the world's highest RCC dam. The project includes the following works :

- Reservoir (V_{RES}=14,700 Mm³)
- RCC Gravity Dam (H=235 m, L_{CREST}=620 m, V_{RCC} = 6.5 Mm³)
- Spillway (at dam crest, No. 7 gates 14x17.5 m, Q = 18,600 m³/s)
- Middle outlet (in the dam body, No.2, Q = 1600 m³/s, L=100 m, D=5m)
- Rockfill Cofferdam (H = 50 m, L = 205 m, Zig-Zag PVC membrane)
- Main Diversion Tunnels (No. 2, L = 1.1 km, D = 14 m)
- Preliminary Diversion Tunnel (No. 1, L= 1.1 km, D= 7 m)
- Power Waterways (No 2, L = 1.0 km, D = 11 m)
- Surge Shaft (No. 2, D = 20 m, H = 60 m)
- Outdoor Power House (N°10x187 MW Francis turbines, Design Head = 211 m, Q = 950 m³/s, Dimensions = 220 x 34 x 46 m)
- Switchyard (No. 5 line bays 400 kV, No. 5 transformers 15/400 kV)

Position held:

Activities performed: Reconnaissance design, Investigations, Feasibility Study, Basic Design, Final Design, Construction Design, Technical Supervision during Construction

BUSALLETTA Dam Upgrade

Year: 2005 - 2008

Location: Italy

Client: Mediterranea delle acque S.p.a.

Main project features: Upgrade of the existing Busalletta dam, for water supply, increasing of the dam height and reservoir volumes. The project includes what follows :

- Current set-up / proposed set-up :
 - Reservoir (V_{RES} = 5 Mm³ / V_{RES} = 6.5 Mm³)
 - Dam (Concrete gravity dam, H = 50 m / H = 53 m)
 - Spillway (Ogee Overflow / Gated spillway with No. 5 flap gates, Dim. 2.1 x 12 m)

Position held:

Activities performed: Pre-feasibility and Feasibility study

CUMBIDANOVU Dam

Year: 2004 - 2005

Location: Italy

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Client: Impresa Nino Ferrari, Beneficiary: Consorzio di Bonifica della Sardegna Centrale

Main project features: Dam for irrigation and water supply including :

- Concrete Gravity dam ($H=72$ m, $L = 264$ m, $V = 0.3$ Mm³)

Position held:

Activities performed: Review of the entire existing final design, Construction design of the dam, slope stabilization works, etc.

GIBE II Hydroelectric Power Plant (IP = 420 MW)

Year: 2003 - 2010

Location: Ethiopia

Client: Salini Costruttori S.p.A., Beneficiary : EEPKO

Main project features: Gibe II (IP = 420 MW) is the 2nd project of the Gibe-Omo cascade, making us of the waters regulated by the upstream Gilgel Gibe dam, and includes the following works:

- Concrete Gravity Dam ($H=49$ m, $L=140$ m, $V_{RES} = 1.9$ M³/s)
- Spillway (at dam crest, $Q = 2325$ m³/s)
- Intake ($L = 24$ m, $H = 33$ m, No. 2 roller gates)
- Power Tunnels ($L = 26$ km, $D = 6$ m, $Q = 101$ m³/s)
- Penstocks (No 2, $L = 1.2$ km, $D = 2.4$ m)
- Surge Shaft ($H=94$ m, $D = 18$ m)
- Power House (Outdoor, No. 4x105 MW Pelton turbines, Design Head = 510 m, $Q_{des} = 110$ m³/s, Dim. 120 x 25 x 36 m)
- Switchyard (No. 2 line bays 400 kV, No. 4 transformers 400/15 kV)
- Access Roads (No. 3, $L = 30 + 35 + 5.5$ km)

Position held:

Activities performed: Reconnaissance design, Investigations, Basic Design, Final Design (Level 1 design) and Construction Design (Level 2 design) , Technical Assistance during Construction

SANTU MIALI Hpp (IP = 27 MW) – Refurbishment and Upgrade

Year: 2003 - 2010

Location: Italy

Client: Sardinia Water Authority (Ente Acque della Sardegna ENAS)

Main project features: Refurbishment and upgrade of the Santu Miali hydropower plant, including:

- Reservoir (Daily regulated Vol. = 1.4 Mm³)
- Headrace Tunnel ($L = 750$ m, $D = 4.25$ m)
- Surge Shaft ($H = 33.5$ m, $D = 8.20$ m)
- Underground Power House (Dimensions 34x16x31 m, No. 1 Francis Turbine, 27.5 MW)
- Main Transformer (N°1, Nominal voltage = 9 / 150 kV, Rated power = 320 MVA)

Position held:

Activities performed: Preliminary design, Final design and Tender documents , Supervision of works (up to installation of the EM equipment)

UVINI Hpp (IP = 15.8 MW) - Refurbishment and Upgrading

Year: 2003 - 2010

Location: Italy

Client: Ente Autonomo del Flumendosa (EAF)

Main project features: Refurbishment of the Uvini hydropower plant:

- Reservoir (Total Reservoir Vol. = 320 Mm³)
- Penstock (Diameter = 4.50 m)
- Underground Power House (D (circular plan) = 17 m, $H = 29.4$ m)
- Electromechanical Works: N° 2 Turbines (Kaplan + Francis), Total IP = 15.8 MW
- Main Transformers (N° 2)

Kaplan: No-load ratio = 9 / 70 kV, Rated power = 17.5 MVA

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Francis: No-load ratio = 0.4 / 15 kV, Rated power = 1.6 MVA

Position held:

Activities performed: Preliminary design, Final design and Tender documents , Supervision of works (up to installation of the EM equipment)

SAN LORENZO Hydropower Plant (IP = 1.2 MW)

Year: 2003 - 2008

Location: Italy

Client: Ente Autonomo del Flumendosa (EAF)

Main project features: Mini hydroelectric plant located on the water supply pipeline network of southern Sardinia, including the following works:

- Outdoor Power House (L=16 m, W= 10 m, H= 7 m)
- Electromechanical Works (N°1 Francis Turbine, IP = 1,250 kW, Max. Q = 1.2 m³/s, Design Head = 117 m)
- Three-Phase Synchronous Alternator (6 kV/1,600 kVA, E = 7.2 GWh)

Position held:

Activities performed: Investigations, Preliminary design, Final design and tender documents, Supervision of the works

SIMBIRIZZI Hydropower Plant (IP = 1,2 MW)

Year: 2003 - 2008

Location: Italy

Client: Ente Autonomo del Flumendosa (EAF)

Main project features: Mini hydroelectric plant located on the water supply pipeline network of southern Sardinia, including the following works :

- Outdoor Power House (L=18 m, W= 10 m, H= 7 m)
- Electromechanical Works (N°1 Francis Turbine, IP = 1,300 kW, Q = 2 m³/s, H = 75 m)
- Three-Phase Synchronous Alternator (6 kV/1,700 kVA, E = 6.5 GWh)

Position held:

Activities performed: Investigations, Preliminary design, Final design and tender documents, Supervision of works

ARCICHIARO Hydroelectric Power Plant (IP = 5 MW)

Year: 2002 - 2006

Location: Italy

Client: Vitaliani & Randich S.p.A. (IPP)

Main project features: Hydropower plant using the waters of the existing Arcichiaro dam. Major works are :

- Gutters (Q = 15 m³/s, L = 3.3 km and D = 1.2 - 1.5 m, L = 5 km and W = 1 m)
- Tunnel (L = 1 km, H = 3.7 m, W = 4 m)
- Power house (Dim. = 30 x 10 m, Q_{MAX} = 2.3 m³/s, IP = 5 MW)
- Electrical line (L = 5.5 km)

Position held:

Activities performed: Preliminary Design

ARDA CASCADE Hydroelectric Power Plant

Year: 2001 - 2002

Location: Bulgaria

Client: Enel Power S.p.A.

Main project features: The Arda cascade includes three existing hydropower plants (IP= 106 + 60 + 103 MW) and three proposed hydropower plants: Madan (IP = 47 MW), Sarnitsa (IP = 69 MW) and Ardino (56 MW + Mini hydro 2 MW).

The feasibility study of Ardino HPP includes:

- RCC Arch-Gravity dam (H=110 m, L=365 m)
 - Spillway (Q = 2,500 m³/s, No.6 flap gates 6x 6 m)
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- Outdoor Power House (No. 2 Francis turbines 2x28 MW)
- No. 1 mini hydro (IP = 2 MW, E = 12.4 GWh/y)

Position held:

Activities performed: Review of all feasibility studies, in collaboration with Enel Power, Feasibility study of Ardino Hpp (including design of dam and appurtenances)

KALIVAC Hydroelectric Power Plant (IP = 108 MW)

Year: 2000 - 2001

Location: Albania

Client: Enel Power S.p.A.

Main project features: Hydropower Plant (IP = 108 MW) including the following works:

- Concrete Gravity Dam (H=80 m, L=375m, $V_{RES}=350 \text{ Mm}^3$)
- River Diversion ($Q = 2,500 \text{ m}^3/\text{s}$)
- Spillway ($Q = 4500 \text{ m}^3/\text{s}$, N° 15 flap gates 5.5 x 12.5 m)
- Outlet (N°2, $Q_{MAX}=540 \text{ m}^3/\text{s}$)
- Intake (N°2, $Q_{MAX}=285 \text{ m}^3/\text{s}$)
- Outdoor Power House (N°2 Kaplan + N°1 Francis turbines)

Position held:

Activities performed: Investigations, Preliminary design, Final design of the civil works

DANKEL Multi Purpose Project including water transfer, hydro (IP = 500 MW), port

Year: 1997 - 2000

Location: Eritrea

Client: Salini Costruttori S.p.A.; Beneficiary: Government of Eritrea

Main project features: Dankel Multipurpose Project includes:

- External port (Red Sea) and Internal port
- Canal A (L = 30 km, W = 15-50 m, H = 9 m, navigable)
- Sariga Rockfill Dam (L = 1.5 km, H = 18 m)
- Canal B (L = 23 km, W = 30-60 m, H = 9 m, navigable)
- Mendah Concrete Dam (L = 300 m, H = 22 m)
- Hydropower plant (IP = 500 MW, E = 1000 GWh)

Position held:

Activities performed: Investigations, Master plan (preliminary project), Feasibility Study

BUMBUNA Hydroelectric Power Plant (IP = 50 - 275 MW)

Year: 1997 – in progress

Location: Sierra Leone

Client: Ministry of Energy & Power, Republic of Sierra Leone

Main project features: Hydroelectric Plant to be constructed in 5 phases, with 275 MW in final phase. The plant currently operating, having IP = 50 MW, includes :

- Rockfill dam (H = 88m, L = 44 m, $V_{RES} = 410 \text{ Mm}^3$)
- Multi-purpose water tunnels (No. = 2, L = 2x620 m, D = 9m)
- Spillway (No. 2 morning glory, $Q = 3000 \text{ m}^3/\text{s}$)
- Outdoor Power house (No. 2 Francis turbines, IP = 2 x 25 MW)
- Transmission line (161 kV, L = 205 km)

Position held:

Activities performed: Assessment, Final design revision and update, Supervision of Works, Monitoring and assistance during operation (Plant on Line since 2010)

BOSA Dam Refurbishment and Upgrading

Year: 1997 – 2009

Location: Italy

Client: Sardinia Autonomous Region, Ministry of Public Works Dam Division

Main project features: Change in destination of use of the existing Bosa Dam for drinking water supply and irrigation. The project includes the installation of regulating

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gates on the existing unregulated bottom outlet together with the refurbishment of the dam. Main works are:

- Bottom outlet gates (No. 4, roller + sliding, HxW = 5 x 3.5 m)
- Dam abutments stabilization
- Dam monitoring System

Position held:

Activities performed: Final design, Supervision of the works

GILGEL GIBE Hydroelectric Power Plant (IP = 200 MW)

Year: 1997 - 2003

Location: Ethiopia

Client: Enel Power S.p.A., Beneficiary : EEPCO

Main project features: Gilgel Gibe (IP = 200 MW) is the 1st hydropower plant of the Gibe-Omo Cascade. The main works of the project include:

- Rockfill Dam (H = 40 m, L = 1,600 m, $V_{RES} = 850 \text{ Mm}^3$)
- Bottom outlet (L = 220 m, D = 1.5 m, $Q = 25 \text{ m}^3/\text{s}$)
- Spillway (L = 48 m, $Q = 2,250 \text{ m}^3/\text{s}$, Gates: N°4 flap 12x8.5m)
- Power Tunnel (L = 8.8 km, D = 5.5 m)
- Surge Shaft (H = 110 m, D = 14 m)
- Underground Power House (Dimensions 83x22.5x41 m, No. 3 Francis turbines IP = 3x66,7 MW , $Q_{des} = 100 \text{ m}^3/\text{s}$, Design head = 220 m)

Position held:

Activities performed: Final design, tender documents, tender supervision, Supervision of construction

BWARI Water Supply

Year: 1997 - 2002

Location: Nigeria

Client: Sarin Iniziative Industriali Spa

Main project features: Pipeline for the drinking water supply of Abuja's District includes:

- Pumping Station (Pumps N° 6, $Q = 310 \text{ l/s}$, H = 95 m)
- Main Pipeline (D = 600 mm, L = 12.500 m, N° 5 Control Cabine)
- Distribution Pipeline (D = 150-300 mm, L = 4.65 m, N° 50 Use points)
- Storage Tank (V = 12.500 m^3)

Position held:

Activities performed: Final and construction design, Supervision of construction for the contractor

ARCICHIARO Dam for Multipurpose uses

Year: 1997 – 2001

Location: Italy

Client: Ente Risorse Idriche del Molise (ERIM)

Main project features: Reservoir for multipurpose uses including:

- Rockfill Dam (H = 89.3 m, L = 270 m, $V_{RES} = 11.1 \text{ Mm}^3$)
- Concrete Weir (H = 29 m)
- Spillway (L = 85 m, $Q = 447 \text{ m}^3/\text{s}$)
- Penstock (L = 3.2 km)
- Access road (L = 3.1 Km, Lane Width = 7.0 m, N°2 Bridges)

Position held:

Activities performed: Supervision of construction

LIMONLU Hydroelectric Power Plants (IP = 50 / 76 MW)

Year: 1997 - 2000

Location: Turkey

Client: TGT Electric Power Construction, Ministry of Energy & Natural Resources

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Main project features: Limonlu hydropower cascade comprises No. 4 plants on the Lamas River to be built in two phases (Phase 1 = 50 MW, Phase 2 = 26 MW). The works of the first phase include:

- Weir (H = 8 m, L = 40 m)
- Power Tunnels (5 km, D=3 m)
- Surge Tank (H = 16 m, D = 12 m)
- Penstocks (2 No., L tot = 3 km; D=2-1 m)
- Power Houses (2 No., Francis turbines, IP = 20 + 30 MW)
- HV Transmission Line (154 kV; L = 1.2 km)

Position held:

Activities performed: Final Design, Tender Documents of the Phase 1 (50 MW). Preliminary design for Phase 2 (26 MW)

DIRE DAM Water Supply

Year: 1997 - 1998

Location: Ethiopia

Client: Salini Costruttori S.p.A.; Beneficiary: Addis Ababa Water and Sewerage Authority

Main project features: Dam for water supply to Addis Ababa includes the following works :

- Dam (Earth Dam type, L=1,980m, H=46m, $V_{RES}=19Mm^3$, $Q=500m^3/s$)
- Canal (L = 200 m, W = 40 m)
- Intake Tower (H = 48.6 m, Steel Footbridge L = 150 m)
- Pipeline (Pipe Diameter = 700 mm, L = 10 km)

Position held:

Activities performed: General review of the design, Dam stability analysis, Final design of intake works, spillway, valve chamber and footbridge

Publications:

- A. Pietrangeli, A. Brasca, S. Galantino, G. Pittalis; January 2013. "Powering on with hydro design"; International Water Power & Dam Construction; January 2013;
- Pietrangeli A., Brasca A., Ricciardi V. 2006; "Collaudo della diga di Monte Crispu e approvvigionamento idrico della città di Bosa (Sardegna)", ITCOLD annual conference 2006

13. Certification:

I, the undersigned, certify that to the best of my knowledge and belief, these data correctly describe me, my qualifications and my experience. I understand that any wilful misstatement described herein may lead to my disqualification or dismissal, if engaged.

[Signature of staff member or authorized representative of the staff] Date: _____
Day/Month/Year

Full name of authorized representative: _____