CURRICULUM VITAE

Name of Staff:	**Axel Scholle**
Profession:	Renewable Energy Consultant, Engineer
Date of Birth:	30 June 1965
Years with Firm/Entity:	Nine
Nationality:	Namibian
Membership in Professional Societies:	Association of Consulting Engineers of Namibia Engineering Professions Association of Namibia Engineering Council of South Africa South African Institute for Electrical Engineers

KEY QUALIFICATIONS:

Axel Scholle's main area of expertise is in the field of renewable energy, technical standards development, feasibility studies, capacity building and energy efficiency. Axel has more than 18 years' experience as a consultant and system integrator.

Axel's main focus in the field of renewable energy is photovoltaic and wind systems in the form of stand-alone and grid-connected embedded generation solutions. Stand-alone solutions include • solar home systems, • school and clinic systems, • commercial AC systems and • hybrid mini-grid systems. His experience includes the conceptualisation of delivery models, establishment of management systems, engineering design, technical specifications and project management.

Axel has contributed towards the standardisation of PV energy systems for rural homes, schools and clinics in southern Africa. He has furthermore played a key role in the development of standards for grid connection of small scale embedded generation in South Africa.

Axel has participated in and led numerous feasibility studies which evaluate renewable energy and energy efficiency options. These included among other the feasibility of country-wide utility scale renewable energy generation, implementation of a rural off-grid electrification programme, solar water heating roll-out and the use of solar photovoltaic water pumping, mostly in comparison to conventional solutions.

Axel has presented and facilitated capacity building training programmes for beginners and advanced solar technicians. In the Federated States of Micronesia, Axel trained and supervised technicians in an EU funded project which involved the installation and commissioning of multi-kW_{peak} off-grid PV systems on remote islands. The training was further extended to grid connection of small scale renewable power plants and presented to utilities in the Micronesia. In China, Axel played a supporting role in a GTZ funded hybrid mini-grid training programme under the auspices of the Chinese Brightness programme.

Axel has conducted energy audits and energy efficiency and demand side management assessments. He has also been involved in implementing the outcomes of these studies.

EDUCATION:

1994 MSc Eng (Energy Studies), Energy for Development Research Centre, University of Cape Town

1989 BSc Eng (Elec), University of Cape Town

SELECTED EXPERIENCE: RENEWABLE ENERGY PROGRAMMES & PROJECTS

2010 - 2011 **Solar PV specialist, PV programme development and technical design for Kigoma region, Tanzania.** Develop a commercially oriented solar programme for productive use opportunities, households and schools and clinics. *Client: Millennium Challenge Account, Tanzania***.**

2010 **Solar PV specialist, Development of an energy audit tool and solar PV design tool, Namibia.** A survey framework and energy audit tool has been developed for MET off-grid sites. The data is processed and a solar PV is sized. The results are compiled in a Bill of Quantity for procurement purposes. *Client: Ministry of Mines and Energy – UNDP/GEF Barrier Removal programme, Namibia***.**

2010 **Solar PV hybrid specialist, Technical design and specifications for solar plants, Mali.** Design and technical specifications of solar PV mini-grid systems ranging from 120kWp to 180kWp. *Client: FRES, Netherlands***.**

2010 **Solar PV specialist, Technical design and specifications for EDF 10, Kiribati.** Design off-grid solar PV systems, mini-grid systems and grid-connected systems and compile technical specifications for EC tender. *Client: European Commission***.**

2009 - 2010 **Solar PV hybrid specialist, PV diesel hybrid mini-grid system for Tsumkwe, Namibia.** A hybrid system is designed for 150 customers with approximately 200 kWpeak of solar PV, 700kWh battery storage and 200kVA power conversion capacity. Individual tasks include hybrid system modelling and design, specifications, metering and load management solutions. *Client: European Commission and NamPower.*

2009 **Solar PV specialist, Review of PV roadmap for South Africa.** Review of the PV roadmap compiled by CSIR South Africa. Assessment of the responsiveness to TOR. Detailed comments on the study content. *Client: GTZ***.**

2008 - 2009 **Solar PV project engineer, Refurbishment of the 68kW$_{peak}$ solar PV grid connected system at BP Office, V&A Waterfront, Cape Town.** Reconfiguration of the grid connected system with new grid inverters, communication setup, internet connection and central display units. *Client: BP South Africa***.**

2009 **Solar PV specialist, Solar grid connected system for UNAM Ongwediva, Namibia.** Design and specifications of grid-connected system for a 40kWpeak grid-connect solar PV system. *Client: UNAM.*

2008 - 2009 **Energy Specialist, Technical standard for the utility interface of grid interconnected small scale embedded generation, South Africa.** The standard describes the requirements for grid interconnection of 100kW and smaller embedded generators. The requirements include utility compatibility, safety and protection and metering arrangements. *Client: Eskom.*

2008 - 2009 **Solar PV specialist, Solar PV market stimulation pilot project, Mozambique.** The project entails the design of a delivery model for private sector market stimulation with minimal intervention using a Wpeak buy-down subsidy anchored at the supplier level. Sub-consultant to KPMG Mozambique. *Client: FUNAE.*

2007 **Energy Specialist, County Strategy Paper, Lesotho.** The project entailed the identification of development pillars within the overall economic and social context of Lesotho. Individual tasks included identification of electricity sector challenges, identification of renewable energy generation projects, grid extension potential and off-grid projects. *Client: African Development Bank and FINESSE.*

2007 **Solar PV hybrid specialist, Applicability of hybrid systems, Namibia and South Africa**. The work presents key criteria for decision makers to determine the applicability of hybrid systems as electricity service provision in remote settlements. Criteria include needs, energy efficiency, cost reflective tariffs, operational capacity, as well as institutional and technical capacity requirements. *Client: DANIDA and DRFN.*

2006 **Energy Specialist, Refurbishment of PV systems at schools and clinics, Namibia.** Refurbishment of PV systems at schools, clinics and nurse homes included system hand-over and drafting of user operating and maintenance instructions. *Client: Ministry of Works, Transport and Communications.*

2005 **Solar PV specialist, Approach to Solar PV Electrification, Angola.** Design of a programmatic approach to off-grid electrification in Angola using solar PV. Developing a private sector market and building capacity through providing systems to public and subsequently private users. Tasks included: Needs assessment; design and costing of energy services packages; appraisal of institutional and financial capacity; *Client: Ministry of Energy & Water.*

2005 to 2006 **Project leader, Implementation of a single grid connected 220kW wind turbine for the Municipality of Walvis Bay, Namibia.** This pilot plant became the first grid-connected wind turbine in Namibia and was implemented as embedded generation operated by a Local Authority. Project components include wind resource assessment, business plan, generation license, EIA, quality of supply, technical design, and contract supervision. *Client: DANIDA and Erongo Regional Electricity Distributor.*

2002 to 2005 **Local project leader, The Gobabeb hybrid mini-grid project, Namibia.** Implementation of a PV diesel hybrid mini-grid for a desert research station. Tasks included: Coordination of the local consulting team; design and tender documents for a 26kWpeak solar PV hybrid system; tariff calculations and revenue collection system; participative process with community; energy management; project administrative tasks. Sub-consultant to COWI. *Client: DANIDA and Gobabeb Training and Research Centre.*

2003 to 2005 **Solar Home System specialist, Transaction advisor for concession for decentralised rural electricity supply with solar systems, South Africa.** Drafting of technical specifications for schools and Solar Home Systems. Compiling performance requirements and operational guidelines for Euro 15 million off-grid concession area in South Africa. *Client: KfW.*

2003 to 2004 **Solar PV specialist, Grid connected solar PV system for the Habitat Centre, Namibia.** Design of grid-connected system and development of specifications for the first official Namibian on-grid PV system. *Client: National Housing Enterprise.*

2002 to 2003 **Project leader, Assessment of two Namibian Solar Home System programmes, Namibia.** Socio-economic and technical evaluation of Namibian Solar Home System programmes for the period of 1996 to 2001. Recommendations on restructuring of the Home Power! programme. *Client: Ministry of Mines and Energy and GTZ.*

2002 **Solar PV specialist, Technical evaluation of the Fee-for-Service PowerCan system, Namibia.** System tests to evaluate functionality of PowerCan with regard to component integration, charging algorithm, system by-pass, theft protection, reliability and protection. *Client: Premier Electric.*

2001 **Solar PV specialist, Technical specifications for the ownership-based SHS programme, Namibia.** Revised technical specifications were compiled for Phase 2002 of the programme, covering technical, installation and documentation aspects. *Client: Premier Electric.*

1999 **Hybrid specialist, Design and implementation of a three phase PV diesel hybrid system, Namibia.** Demand assessment and sizing of a PV diesel hybrid system. Development of dispatch strategies for optimised system operation. The design is based on a 100kW bi-directional power converter with up to 70kWpeak solar PV. *Client: Terranova.*

1997 to 1998 **Project leader, Solar PV electrification projects for clinics and schools in rural areas, Namibia.** Management, procurement, roll-out and installation of off-grid solar PV systems for 40 schools and clinics. Commissioning and handover to the system operators. *Client: European Commission and Department of Works*

1996 to 1997 **Project leader, implementation of the owner-ship based Solar Home System Programme, Namibia.** An off-grid programme based on Solar Home System ownership and supported by a revolving fund. Tasks included project management, establishment of systems, system integration and quality control. *Client: Ministry of Mines and Energy, GTZ.*

1993 to 1994 **Project engineer, Field tests of different PV water pumps under real operating conditions, Namibia.** Three types of PV water pumps were tested under field conditions and compared on an efficiency and cost basis. *Client: Solar Age Namibia.*

SELECTED EXPERIENCE: FEASIBILITY STUDIES

2010 **Energy Specialist, Solar PV feasibility assessment for Millennium Challenge Account, Namibia.** The project entails the feasibility assessment of grid connected solar PV projects on MCA funded Resource Centres taking into account anticipated electricity cost increases as well as time of use tariffs. The analysis includes feed-in tariff assessments for grant-funded, loan funded and commercially funded PV implementations, *Client: MCA.*

2007 - 2008 **Project Leader and Energy Specialist, Electricity Supply and Demand Management Options for Namibia – A Technical and Economic Evaluation, Namibia.** The project entails a cost benefit analysis of a range of generating and demand options for the Namibian electricity sector and the development of suitable energy mixes (scenario's) to determine the economic impact on the Namibian economy. Individual tasks include project coordination and technical assessment of wind, concentrating solar, hydro, solar PV, biomass, and nuclear power supply options. *Client: DANIDA and REEE Institute.*

2005 - 2006 **Technical and financial analysis, Feasibility of replacing Diesel Water Pumps with Solar PV Pumps, Namibia.** Technical assessment of solar PV water pumps on the Namibian market, life cycle cost analysis of diesel and solar PV water pumps down to 200m head. Preparation of a comparative costing tool based on a spreadsheet with a user friendly interface. *Client: Ministry of Mines and Energy – UNDP/GEF Barrier Removal programme.*

2005 **Financial Analysis, Feasibility of Solar Water Heater implementation in Namibia.** Life cycle cost analysis of Solar Water Heaters in comparison to Electrical Water Heaters. The user-friendly tool, written for the Namibian market, contains a database of towns, tariffs and Solar Water Heaters. Life cycle cost, years to breakeven and financing scenarios are presented. *Client: Ministry of Mines and Energy – UNDP/GEF Barrier Removal programme.*

2001 **Renewable energy specialist, Business plan and implementation strategy for a large scale off-grid electrification programme, Namibia.** Investigation into the modalities and feasibility of a NamPower-led off-grid electrification programme in Namibia. Tasks included the identification of a range of services for households, technical options and comparative costing. *Client: NamPower.*

SELECTED EXPERIENCE: CAPACITY BUILDING

2009 **Solar PV specialist, Solar PV grid-connect training for utilities, Federated States of Micronesia, Pacific.** A training course for utilities was compiled for solar PV grid connected training. Focal areas were: Solar PV grid-connect components, sizing and utility interface requirements in terms of compatibility, protection, safety and metering arrangements. *Client: European Commission.*

2008 - 2009 **Solar PV specialist, Training and installation supervision of professional off-grid systems on the outer islands of the Federated States of Micronesia, Pacific.** The project entailed the training and supervision of 70 participants in the technology and installation of solar PV AC systems (total of 120kW_{peak}) on remote Pacific islands. Individual tasks included lead training, project implementation and logistics and supervision of 45kW_{peak} solar PV systems. Sub-consultant to Contained Energy. *Client: European Commission.*

2006 **Solar PV Specialist, Code of Practice for Solar Home Systems, Solar PV Water Pumps and Solar Water Heaters for Namibia.** User-friendly Codes of Practice were compiled for SHS, PVP and SWH on best installation practices. *Client: Ministry of Mines and Energy – UNDP/GEF Barrier Removal programme.*

2005 **Solar PV capacity building, Solar Technicians Training Workshop, Namibia.** Lectures and practical training of solar PV technicians for the Home Power! programme. Training included uses of solar PV, battery technology, system handover, after sales service and troubleshooting. *Client: UNDP/GEF Barrier Removal programme and Ministry of Mines and Energy.*

2003 **Solar PV hybrid system energy specialist, Practical training on hybrid systems for the Chinese Brightness Programme, China.** Facilitation of practical training on hybrid system mini-grid technology for 'Train the Trainers' programme. Critical assessment of existing hybrid mini-grid systems. *Client: GTZ.*

2002 **Project leader, Energy Audit at John Meinert Printers, Namibia.** Energy audit and evaluation of potential energy savings at local printing industry. Training of students from the PolyTechnic. *Client: PolyTechnic of Namibia.*

2002 **Solar energy specialist, Short course presentation - Boost your energy business, Namibia.** Presentation of training course on Solar Home System technologies, PV systems, PV water pumps and solar water heaters. *Client: Carl Duisberg Gesellschaft (CDG/InWent).*

SELECTED EXPERIENCE: ENERGY EFFICIENCY

2006 **Energy Specialist, Demand Side Management study and implementation plan, Namibia.** The study provides an overview and evaluation of DSM options for Namibia. Individual task was the evaluation of Energy Audit in the commercial and industrial sector. *Client: Electricity Control Board of Namibia.*

2002 **Project leader, Energy Audit at John Meinert Printers, Namibia.** Energy audit and evaluation of potential energy savings at local printing industry. Training of students from the PolyTechnic. *Client: PolyTechnic of Namibia.*

2000 **Project leader, Energy audit and appropriate energy supply for the Gobabeb Training and Research Centre, Namibia.** Compilation of an energy audit at the Gobabeb Centre. Generation of load profiles for current and future scenarios. Energy efficiency considerations. Four supply options (grid, diesel, PV and PV hybrid) were sized and evaluated though a life cycle costing approach. *Client: GTZ.*

LANGUAGES:

	Speaking	Reading	Writing
English	Excellent	Excellent	Excellent
German	Excellent	Excellent	Excellent
Afrikaans	Good	Good	Fair
Portuguese (2001)	Fair	Poor	Poor

EMPLOYMENT RECORD:

2001 - present	EMCON Consulting Group, Namibia: **Member: Energy Consultant**
1999 – 2001	Solar Age Namibia, Windhoek, Namibia: **Managing Director**
1994 – 1998	Solar Age Namibia, Windhoek, Namibia: **Project Engineer & Manager**

PUBLICATIONS/PAPERS

Scholle A, Applicability and requirements for wider hybrid system implementation, prepared for the Hybrid Electricity Systems Powering Mini-grid Symposium, DRFN, Windhoek, Nov 2007.

Scholle A, Afrane-Okese Y, Experience with hybrid systems in South Africa, prepared for: Hybrid Electricity Systems Powering Mini-grid Symposium, DRFN, Namibia, Nov 2007.

Scholle A, Utility Operated Wind Energy Project in Namibia, prepared for African Utility Week, Cape Town, May/June 2007.

Gabler H, Bopp G, Haugwitz, F, Müller H, Haarpaintner G, Scholle A, Zou X and Ma S, *Village Electrification through PV/Wind Hybrid Systems in the Chinese Brightness Programme*, prepared for the 2nd European PV-Hybrid and Mini-grid Conference, Kassel, Germany, September 2003.

Scholle A, *Practical experiences from the Solar Home System pilot phase in Namibia*, Solar Age Namibia, Windhoek, Namibia, January 1998.

Scholle A, *Three phase PV water pumping in Namibia – A look at efficiency and cost,* Solar Age Namibia, Windhoek, Namibia 1995.

Scholle A, *Evaluation of two prototype three-phase photovoltaic water pumping systems*, MSc dissertation, University of Cape Town, May 1994.