ENERGY COMMISSION OF NIGERIA

(FEDERAL MINISTRY OF SCIENCE AND TECHNOLOGY)

FEDERAL REPUBLIC OF NIGERIA

REPORT ON

NATIONAL ENERGY SUMMIT FOR STAKEHOLDERS 2014 (STEC 3004688)

JUNE, 2015

CONTENT

PREFACE

In the execution of the 2014 Capital Projects of the Energy Commission of Nigeria under the heading "National Energy Summit for Stakeholders" the Commission organized two energy conferences with the following themes:

"***Energy Sector and the Transformation Agenda in Nigeria" and***
"Solar Energy and Economic Transformation".

The later conference was organized in collaboration with the Solar Energy Society of Nigeria and the Association of Solar Energy Practitioners of Nigeria, and the conference was tagged "National Solar Energy Forum (NASEF).

The National Energy Summit is to provide fora for discourse on the Nigerian energy sector in order to facilitate the monitoring of the performance of the energy sector in the execution of government policies on energy.

SUMMARY OF RECOMMENDATION

The summit therefore made the following recommendations:

- A conducive business environment for Petroleum Industry Operations is imperative
- There should be enhanced exploration and exploitations of petroleum resources for the benefit of Nigeria
- Domestic Gas supplies be optimized particularly for power generation and industrial development
- Established a progressive fiscal framework that encourages further investment in the petroleum industry, while optimizing the revenue accruing to government
- Established commercially oriented and profit driven O/G entities
- Deregulate and liberalize the downstream petroleum sector
- Well articulation and passage of the PIB can aid adequate power supply
- Efficient and effective regulatory agencies be put in place for O/G
- The Petroleum industry should be more Open and Transparent in its operations
- A resuscitated coal industry through active private sector participation and with high local content is a way forward
- Adequate funding of the coal industry to meet the energy and power requirement of the country in a cost effective and sustainable manner is paramount
- The tar sands/bitumen reserves be explored and exploited through active private sector participation and high local content in an environmentally friendly manner for domestic and international markets
- Nuclear energy be utilized for peaceful purposes
- Requisite manpower for the peaceful use of nuclear power is essential as technology transfer is not easy
- There must be adequate storage and disposal facility of nuclear waste in a safe and sustainable manner
- To have renewable energy mainstreamed into the nation's commercial energy mix through active participation of private sector and high local content
- To have renewable energy resources contribute about 20% in meeting the electricity demand by 2030

- To have energy efficiency and conservation best practices promoted and its effect doubled by 2030
- That power contributes to a double digit growth of the economy such that Nigeria becomes within the 20 largest economy in the world by 2020 or thereabout, can only be through active private sector participation with high local content and in an environmentally friendly manner
- Policy shift is needed to bring about adequate gas supply for power generation
- There should be synergy between Agencies
- Financing energy projects starts with the appropriate policy and regulation
- Appropriate pricing is also an investment incentive
- Availability of Low Cost Long Term Energy finance is a necessity
- Solution imbedded in the National Integrated Infrastructure Master Plan
- Expedite the payment of Legacy debts to enhance investment in new technologies by the power companies
- Specific financing for captive or embedded generation is necessary
- There is need for the institutionalization of the National Energy Policy and the National Energy Master Plan through an act of the National Assembly to ensure policy consistency in the energy sector.

Director General/CEO,
Energy Commission of Nigeria (ECN),
Abuja.

REPORT ON THE NATIONAL ENERGY SUMMIT OF STAKEHOLDERS 2015-06-23 (STEC 3004688)

1. CONFERENCE ON ENERGY AND THE TRANSFORMATION AGENDA IN NIGERIA

The Conference on **Energy and the Transformation Agenda in Nigeria** was held at Reiz Continental Hotel Central Business District Abuja, FCT, from 17th – 18th March, 2015. Participants were drawn from the Federal Ministries, Departments and Agencies (MDAs), Academic Institutions, Financial Institutions, Civil Society Organizations, Development Partners, Non-Governmental Organizations (NGOs), Private Sector and The Media. More than 200 participants attended the Summit.

The Opening Ceremony of the Summit was chaired by the President Nigerian Academy of Engineering, Engr. Professor R. I. Salawu. The Keynote Address titled "**Overview of the Nigerian Energy Sector"** was delivered by Engr. Prof. E. J. Bala, Director General/CEO, Energy Commission of Nigeria. The Special Guest of Honour was the Honourable Minister of Science and Technology, Dr. Abdu Bulama, who was ably represented by the Director of Chemical Technology and Energy Research of the Ministry, Engr. Abbas Gummi, who also declared the Summit open. Goodwill messages were delivered by the Minister of Foreign Affairs, Ambassador Aminu Aliyu Wali, who was ably represented by Ambassador Bukun-Olu Onemola; Minister of Water Resources, Mrs Sarah Ochepe, ably represented by Engr Nicholas Madu, Director of Dams and Hydropower in the Ministry; Minister of Environment, Mrs Lawrencia Laraba-Mallam, ably represented Dr. Peter Yerima Tarfa, a Director in the Ministry; Minister for Mines and Steel Development, Arch Mohammed Musa Sada, ably represented by Mr. Frank Odoom; Country Director, UNIDO, Dr Patrick Kurawa, ably represented by Alhaji Mustapha; and representative of JICA. Engr. J. O. Ojosu, Director, Energy Planning and Analysis, ECN, gave the Vote of Thanks.

The following sub-themes were comprehensively discussed during the technical sessions, with notable speakers from the Energy Sector;

- Electricity from Renewable Energy Sources in Nigeria by 2030
- Status of Nigerian Nuclear Power Programme
- Energy and Gender in Nigeria
- Reforming the Petroleum Industry in Nigeria
- Challenges in the Post-Privatization arena of the Nigeria Power Sector
- Challenges in the Regulation of the Nigeria Power Sector
- Coal Industry Reforms in Nigeria
- Energy Financing in Nigeria

Objectives of the Summit were:

- To Provide a forum for discourse on the Nigerian Energy Sector;
- To Assess the effectiveness of existing energy systems and policies in achieving the component of, and contribution to, the Transformation Agenda and Vision 20:2020 in order to move the country towards a more Sustainable Energy future ;
- To generate ideas that will help steer the development of the Nigeria energy sector on the path of sustainability;
- To address both current and anticipated challenges of the energy sector affecting or likely to slow down the pace of achieving the Transformation Agenda.

PLENARY SESSION I

Topic: Electricity from Renewable Energy sources in Nigeria by 2030

Chairman: Prof. U. O. Aliyu, ATBU, Bauchi

Discussants: Prof. B.G. Danshehu, UDFU, Sokoto; Prof. T. A. Kuku, OAU, Ile-Ife; Prof. I.S. Diso, Bayero University, Kano and Engr. A .O. Yusuf, Nigeria Electricity Regulatory Commission (NERC).

Speaker: Absent

Rappateurs: Mrs. Ado Abdullahi, Mr. Samaila G. Zaku, ECN

Chairman: - The Chairman remarked briefly that most renewable energy resources are derivatives of solar energy.

Prof B. G. Danshehu: - He discussed the fundamental parameters of solar energy which are;
Thermal system, Biomass, Wind and PV, and concluded that Nigeria have no option than to embrace renewable as an alternative source of electricity generation.

Prof T. A. Kuku: - He discussed the application of solar energy in area like drying farm products, heating of water, street lightening. He advised that there should be a standard price for solar products and training of right people to be able to manage the solar industry.

Prof I. S. Diso: He discussed the late penetration of renewable energy into the market in the country. He advised that something should be done about the cost which is too expensive for now. He also suggested that we create awareness of the solar energy to the public and encourage the building of solar storage facilities.

Engr A. O. Yusuf: He talked about formulating a rural renewable energy policy which will encourage more participation. He advised that water heating in the house should be done by solar instead of using grid. The UN projected 50% penetration of renewable energy by 2030.

Comments and recommendations:

- Nigeria needs a roadmap for the development and deployment of renewable energy especially solar systems for electricity.
- There are needs for provision of local manufacture of associated components like storage battery, inverters, control, protection systems, meters, PV system etc.
- Manpower training and development to be solution providers in renewable energy electricity supply and not just consumers of imported products and technology.
- NERC needs to provide more technical guidelines for the distribution and/or embedded generation being promoted.
- There is a need for solar thermal renewable energy resource which is the Ocean Thermal Energy Converter (OTEC) technology. The OTEC technology is a multi-product technology that will produced electricity and many exportable products such as hydrogen for fuel cell, ammonia for fertilizer, and aviation fuel
- Nigeria needs to look into the economic justification for increasing the share of renewable energy in country's energy.
- Building local capacity for manufacturing: Nigeria should look at components and modules it can invest into, so as to develop local manufacturing capacity for renewable energy technologies. For example, the use of solar energy for charging cell phones.
- Nigeria should focus on improving the quality of the grid to enable it accept electricity from renewable energy before NERC starts to develop an ambitious feed-in tariff. We need to ascertain the state of readiness of NERC to cope with the challenges of feed-in–tariff especially with the

Bi-directional flow of electricity, because this will affect new specifications that will affect the distribution code to ensure safe operation.

- ❖ Nigeria needs to look at having a sustainable strategy for rural electrifications through renewable energy source.
- ❖ Nigeria needs to re-examine the reliance of solar for street lighting as a solution because is being vandalized. Therefore a sustainable strategy should be developed before further deployments.
- ❖ Government should subsidise the cost of solar products to encourage users.

PLENARY SESSION II

Topic: Status of Nigerian Nuclear Power

Chairman: Prof. Bassey Okon Itah-Ewah, former Minister of Science & Technology

Speaker: Dr. Franklin Erepamo Osaisai, Chairman, Nigeria Atomic Energy Commission (NAEC)

Discussants: Prof. Lawrence James Dim, (DG, NNRA), Prof. B. B. M. Dewu, (Director, CERT, Zaria) and Prof. I.M. Umar, (Gombe State University)

Rappateurs: A. Hammadikko and Z.B. Saidu (Mrs.), ECN

Summary of Presentation

The lead paper presentation was presented by the Chairman/CEO of NAEC Dr F. Erepamo Osaisai. He said that the reasons why Nigeria should go nuclear includes the following

- The National Energy Policy (NEP) by gives the mandate to go nuclear and the energy use projections by ECN support the use of nuclear energy.
- That Nigeria oil and gas will dry up by 2035 and our source of fossil fuel for energy will finish. So there is the need to look for other sources of clean energy which is Nuclear energy.
- The proposed Nuclear Power Plant will add 1000MW to the National grid;
- It will take over 15 years to successfully implement a NPP;
- The NPP was approved by Government in 2007 with NAEC being the promoter, NNRA the regulator and ECN the policy maker with other stakeholders like NESREA, NEMA, NERC etc fully involved in the NPP;
- in line with the enabling Act, FEC decisions and subsisting Presidential approval, NAEC is primarily responsible for the Implementation and coordination of National HRD, R&D and capacity building activities

Progress made so far by NAEC

i. NAEC is fully on track in the implementation of the first phase of the approved national nuclear power road map in developing the critical NPI, particularly manpower training and capacity development;

ii. About two-dozen physical projects for the emplacement of the requisite nuclear power infrastructure for education, training and research are at various stages of completion in the six national nuclear energy research centres;

iii. Preliminary site selection activities have been concluded and two suitable sites have emerged for which detailed evaluation and characterization studies would be conducted on the approval of the FGN. The site are located in:

- ✓ Geregu/Ajaokuta Local Government Area of Kogi State in the North Central Zone of the country.
- ✓ Itu in Itu Local Government Area of Akwa Ibom State in the South-South Zone.

iv. The successful completion of these elements of the programme will create the enabling environment for the participation of suitable international nuclear power plant vendors and partners to participate in the national NPP programme;

v. Expectedly, the funding of these elements (NPI) of the programme shall remain the responsibility of the Federal Government as approved by the FEC in 2007;

vi. The expected ownership/financing model for the actual construction of the nuclear power plants would entail either a Build, Own, Operate and Transfer (BOOT). These are part of the Commission's discussions with our development partners.

He concluded that the National Economic Management Team (NEMT) has approved a sustainable funding structure for the building of the critical National Nuclear Power Infrastructure (NPI) for the next several years, and also approved the BOOT Contractual Model for the financing of the construction of the NPPs. Already discussions on finalizing the contractual agreement for the design, construction, operation and decommissioning of Nigeria's first Nuclear Power Plants is ongoing.

Director General NNRA

He commended Nigerian's initiative to go Nuclear through NAEC and NNRA and other stakeholders. He said that nuclear power will substantially improve our energy needs. He pointed out that the NPP is capital intensive and takes a long time to implement. He agreed that the risk of accident is minimal in NPP as compared to other energy sources. He said that NNRA is pursuing its mandate of regulating ionization radiation in Nigeria.

Prof. I. M. Umar

He said that due to economic and population growth projections made by ECN, there is need for Nigeria to go nuclear to meet the country's energy demand. He added that Nuclear Power knowledge is very important and is needed urgently, and enjoined that all stakeholders should be involved and resources must be judiciously utilized in the process of implementing the NPP.

Prof. B. B. M. Dewu, Director, CERT Zaria

Nigeria Research Reactor NIRR-1 was commissioned in 2004 and has been upgraded. Between 5 to 10 PG students are graduated annually from CERT Zaria where the NIRR-1 is situated and it absolves over 30 students annually for Industrial Training. The research reactor has been a success story with no case of accident or mismanagement. He advised that every hand should be on deck to make the NPP a success too so that the international community can be convinced of Nigeria being able to carry out a NPP.

Comments and Questions

Dr. Francis Ibitoye, Commissioner, Research and Infrastructure Development, NAEC.

The Nigeria Atomic Energy Commission in addition to application of nuclear technology for power generation, is making efforts to procure a nuclear research reactor for multipurpose application in nuclear medicine, agriculture, industrial etc. Currently, nuclear medicine clinics in Nigeria import radioisotopes for diagnostic and therapeutic purpose from abroad, with attendant high costs. A research reactor with multipurpose application can be used to produce these radioscopic materials and also used in developing the needed manpower for the nuclear power programme.

Prof. Usman O. Aliyu

I should state that I am a strong believer that Nigeria will ultimately acquire Nuclear Power Plant to meet her energy needs. However, I have the following technical questions for the chairman and discussants.

i. For a Nuclear Power Plant (NPP) to be admitted into an existing integrated power system, the reliability must be high unfortunately, the reliability of the Nigerian power system is too low to admit Nuclear power plant that is expected to operate in base region and is it too optimistic to have roadmap that expects the first Nuclear power plant to be commissioned by year 2022? I am aware that it typically takes 7years to construct and commission a NPP.
ii. What type of technology are we expecting? There are many types like the Pressurized water reactor, boiling water, reactors e.t.c
iii. What are your views on modular power reactors (typically 100MWe) that some governors (Katsina state) and former governor (Imo state) have expressed interest in?

Responses

In his response to the questions the speakers identified, the following challenges in the implementation of the NPP, especially challenges with technology management:
i. Nuclear technology is capital intensive and is not easily given.
ii. Acceptability of the nuclear technology.
iii. Capital requirement is high.
iv. Breaking away from the national malaise of lack of a maintenance culture in effectively managing nuclear technology.
v. Managing and effectively containing the security issues associated with the development and operation of nuclear power plants. This will entail:

- Imbibing of security and safety culture which is intrinsic in the training of nuclear professionals;
- Interface with relevant security agencies to strengthen national security commitment to programme from the outset; and
- Investing in requisite nuclear security infrastructure.

vi. Enthronement of national transparency in programme implementation, as well as commitment to safeguards, so as to earn and continuously enjoy international confidence in the purely civil nature of the national nuclear power programme.

Recommendations

Implementing a new Nuclear power programme is a daunting task; it requires a serious national commitment over time, as well as a proper structured national institutional framework to ensure sustainability. The challenges, though serious, can be surmounted with meticulous planning:

- Strategy plan to be implemented
- There is need to deepen the culture of commitment to efficiency
- Execution of NP programme requires high level international diplomacy and Support from international organizations for nuclear technology transfer.
- There is need to have a good project managers to have a successful nuclear project.
- Government Support-Full government support is necessary in ensuring that appropriate structure for handling such a programme are in place and working is highly necessary and essential.
- Make Effective use of all past experiences.
- Mobilizing and taking along all stake holders and resources: There is need to build the necessary confidence in all partners in the NP programme, especially the regulatory/central organizations in such matters.

- There is a need to established Administrative structures: Administrative structures may sometimes be cumbersome but they are necessary, such structures provide means of checking and ensuring the performance of the organization as regards its mandate, optimal performance of personnel.
- There is need to partner with technology owners.

PLENARY SESSION III

Topic: Energy and Gender in Nigeria

Chairman: Engr. Mrs J. Olu Maduka Represented by Prof. Segun Aderibigbe

Speaker: Mrs. Monica Maduekwe, Coordinator, ECOWAS - ECREEE Programmme on Gender Mainstreaming in Energy Access (ECOW-GEN)

Discussants: Dr. Mrs. Bridget Obi, Children of the Farmers Club; Dr. Mrs. Roseline Kela, ECN.

Rappateurs: Engr. Zainab A. Datti, Engr. Toyin Alozie (Mrs), ECN

Chairperson:

The session commenced with an introduction by the Chairperson, into the importance of gender mainstreaming in energy policy and activities. He mentioned that gender assignment has historically been a social and cultural heritage which we now are challenged to disintegrate and make it all encompassing to ensure the energy needs/knowledge/technicalities embrace all sexes.

Speaker's Presentation

Mrs. Monica Maduekwe, ECOW-GEN Coordinator, ECREEE, spoke on "The role of equality and inclusiveness in universal energy access and the regional model: "ECOW-GEN". She applauded the ECN on the revised National Energy Policy that included mainstreaming gender in energy policy and summarized the socioeconomic situation in Nigeria, where 50% of a population of 174 million people live in rural areas; less than those 50% have access to electricity; and only 25% of households have access to non-solid fuels. Findings showed that the different types of fuels are accessible to rural and urban households: Rural households predominantly consume fuel wood and kerosene, while urban households mostly utilize LPG, gasoline and electricity, with 76% of all households using traditional biomass for cooking.

Challenges & Barriers

- Challenges and barriers faced in improving energy access are Financial, Awareness, Capacity, Technical, Policy and Regulatory
- Financially, rural electrification projects are expensive and these rural communities have low purchasing power. These communities tend to be unwilling and at times unable to pay the cost of grid inclusion, while consequently the private sector that would have been ideal to undertake the expansion isn't financial strong enough to finance energy and power infrastructure.
- Renewable energy practices, RE technologies and large scale projects are still largely dependent on foreign expertise, investors and financial institutions to develop and promote tem
- With the artificial costs of petroleum products and inadequate tax collection and non-cost reflective tariffs system, policy and regulation of RE is difficult.

Conditions to achieving universal energy access

- These barriers to universal barriers to energy access has led to the global efforts named SE4ALL (Sustainable Energy for All), whose goals are to ensure universal access to modern energy services, double the share of renewable energy in the global energy mix and double the global rate of improvement in energy efficiency.
- The solution strategies towards the SE4All goals include***: mobilizing human and financial capital, creating investment opportunities and facilitating dialogue and engagement.***
- The rational for inclusiveness and gender equality into these strategies is because Nigeria still has a relative low population of women into the labour force and one of the lowest female entrepreneurs in sub Saharan Africa, where their potentials are under-utilized or concentrated in sectors with low revenues and wages with negligible employment of women in fabrication firms
- Women have little to access credit and even the small percentages that apply are least likely to be provided a loan, although their business could provide further employment opportunities.
- Technical employees in the energy sector and decision making roles lack an equal playing field, with modern energy technology dubbed as "men's work", there are fewer women trained and educated in said disciplines and positions.

Status of gender mainstreaming in Nigeria's energy access strategy

- Presently, the national rural electrification strategy includes a gender dimension but only to the extent of its objectives which include raising living standards through improved water supply, lighting and security as well as promotion of domestic appliances utilization
- The National Renewable Energy Masterplan has specifically targeted gender dimension in remote and inaccessible rural communities with the hope for off-grid electrification.

Opportunities

- Women could be empowered, as entrepreneurs, to make both intellectual and business-wise contributions to the business of expanding energy access (in both urban and rural households)
- Developing women's human capital would enable Nigeria mobilize and utilize the full potential of its abundant human resources to improve electricity access and support the transition to clean energy technology development, in the most efficient and effective way.
- Barriers to girls pursuing careers in the technical fields of the energy sector could be addressed to allow more women participating the design, development and implementation of energy projects.
- The energy sector is a lucrative sector. Ensuring that women have opportunities to benefit from this sector could contribute towards poverty reduction in the country.

ECOW-GEN

- ECOW-GEN is a brain child of ECREEE that seeks to steer member states towards gender mainstreaming in policy formulation, legislative drafting, energy project/programme design and implementation, with the intent to promote equality in energy development through equal access to resources, opportunities and equal contribution to the decision making processes that shape and influence energy expansion in West Africa.
- ECOW-GEN seeks to achieve their through various high impact initiatives such as creating women's business fund that supports the establishment and expansion of women-led innovative energy business,

a women's technical exchange programme to facilitate learning and knowledge through women sharing group and break social and cultural norms in terms of women in technical roles

- ECOW-GEN also seeks economic empowerment of women through energy for productive uses such as agricultural business and fostering functional literacy. This will also include development of youth leadership in energy to encourage and support young innovators in research and development of appropriate technologies

Some notable achievements include:

- 70 energy experts have trained on mainstreaming gender in energy policies and 250 participants comprising of energy ministers and women groups have also been trained in developing action plans
- The Framework Action Plan on 'Women's Economic Empowerment through Energy Access in the Mano River Union (MRU) Sub-region developed with, and adopted by, MRU Gender and Energy Ministers.
- Implementing demonstration projects in Ghana and Senegal that would lead 1000 women street vendors access to improved LPG stoves and installation of 13 clean and improved furnaces for fish smoking in rural areas of Ghana and Senegal, respectively though the Women's business fund.
- ECOW-GEN is pioneering the development of the first regional ***gender-sensitive and gender-responsive energy policy***. It is envisaged that the policy will be validated and adopted in 2015 with a series of events organized under the framework of the Beijing +20 and SE4ALL.
- The Objective of this ECOWAS gender and energy policy is to address existing barriers to the equal participation and benefit sharing between the sexes in the expansion of energy access in west Africa and ensure success of the SE4All initiative in the member states

Conclusion/ Recommendations

- Inequalities exist in terms of opportunities and contribution to expanding energy access as well as benefitting from the energy interventions in the region. With advancements in information and technology through the technology revolution of the last two decades, clean energy technology is expected to be the next technology revolutions and the ECOWAS is set to benefit with the adopted clean energy policies, but the existing barriers have to be addressed for this to be a success. To stay on track in increasing energy access, questions on beneficiaries, impacts of interventions and gender participation in the process should be taken into consideration at every step.

- The justification for gender mainstreaming is more than about equity or equality but it is just smart economics: more people trained (Human resource), better energy security, economic growth and development and environmental sustainability.
- Post 2015, Nigeria is expected to include regional gender and energy policy to national strategy for mainstreaming in energy access. These gender responsive measures and specific sensitive energy programmes will close gaps in energy access through implementation, which, when successful will sweep into other sectors of the economy,

<u>Discussants</u>

Dr. Mrs. Bridget Obi

- She applauded ECN's campaigns and awareness exercises towards energy access for all. About 75% of Nigerian populations still use firewood for cooking which is causing deforestation at an alarming rate. Yet in the rural setting where forest is steadily decreasing, firewood costs N200.

- Kerosene which is the other alternative fuel for most rural areas is however expensive. Unlike its other petroleum counterpart, vehicle fuel, it is still sold expensive and due to its domestic utilization women are majority of the procurers. WHO has stated that 95,000 deaths occur from smoke related sickness; 3rd from Malaria and HIV/AIDS, yet, there is sadly little or no awareness campaign of dangers of smoke inhalation. Health wise, these lamps that use kerosene also give off fumes that are dangerous and fatal. She stressed the importance of energy efficient woodstove that already exists but is taking a long time to reach majority of the women out there. This would require the efforts and support of the government

- She cited the example of Sierra Leonean society, where a school was established that trained women on RE technology by assembling solar panels. This energized rural electrification and the women established themselves as solar women engineers. This project was further made successful through the support of their government. But a similar programme failed in Liberia.

Dr. Mrs. Roseline Kela

- Gender is also important not only because men and women use, benefit from and access energy differently, but because sometimes the opportunity of one of the sexes may impact the opportunity of the other. When gender issues are in the mainstream, they are central to what the organization is trying to do. Gender mainstreaming stands for "good governance". While gender mainstreaming is generally voiced by most development organizations as an objective of their establishments, yet there is little consensus concerning how to achieve it.

- She summarized the various challenges facing the country in achieving gender mainstreaming in energy policy and programmers: social and cultural restrictions for females, lack of information on gender and energy, small proportion of women in relevant professions and positions of authority, low institutional capacity and inadequate gender specific data.

- She cited some strategies that needed to be expanded upon to promote gender and energy advocacy, which included: identification of stakeholders and determine knowledge gaps, influences and interests; providing evidence based messages; engaging in awareness creation and training activities[building coalitions; developing linkages among related development concerns. She further reiterated that the national energy policy and renewable energy masterplan by the ECN took care of gender mainstreaming in the energy energy.

Questions / Comments

Mr. A.O. Aliyu, Deputy Director, Energy Information Systems, ECN

- He mentioned the efforts made by the Energy Commission to be more gender aware since 1996 through practices like the Biogas Digester in Lagos that was used by women to provide cooking gas. The Commission went ahead and collaborated with ENERGIA network and Friends of the Environment (FOTE) to assist and advice in mainstreaming gender balance into the energy mix. He recommended that sensitization needs to include Local Governments in the rural areas, with Local Government counselors and chairmen being targeted into understanding the importance of gender balance.

Prof. B. G. Danshehu, Director, Sokoto Energy Research Centre, Usmanu Danfodiyo University.

- Even though women are involved in energy production and management, it should be noted that in many parts of this country, especially in the Northern part of Nigeria, it is the men that are involved in

every production, it is the men that gather wood, cow dung etc. for women to utilize at home. Limitations in terms of affordability, availability and accessibility are great factors not given consideration in the design of most gender programmes. There is also limited understanding within urban cities which is mostly not in line with actual socio-economic labour of the rural people

Barr. A. Y. Elamah, Deputy Director, Energy Commission of Nigeria

- The result of the campaign is such that women are now dominant in petrol station as attendant. It used to be an 'all-male affairs'. Vehicles used by women are always said to be better used, especially when considering "Tokunbo Cars". A situation that presupposes that women are better drivers and better at taking care of their cars, and yet women are not considered for employment as drivers. The use of the word "GENDER" is such that the men feel sidelined when it is supposed to be leveraged for equality. If this is so, why not create and give specific loans to men to start businesses in areas where there are fewer men.

RESPONSES

Mrs. Monica Maduekwe

- Gender is both men and women; however women are mentioned often because of the disparity of opportunities. In schools more males graduate with engineering, science, etc degrees, so more of them are placed in positions of authority in sectors relating to these degrees, even where women technocrats might be more insightful.

- Women should be empowered economically, so they can climb up the professional ladder. This will push sustainability of family finance. There is need to provide more than just woodstoves but also how to apply its use economically.

- The creation of the ECOWAS Women's Business Fund (WBF) to stimulate the development of women-led business initiatives in the energy sector. ECREEE will work with Member States to identify and support, through the fund, innovative energy projects implemented by women groups and associations. This is all about creating an even playing field.

Mrs. Bridget Obi

- Women are the focus about gender mainstreaming because men tend to leave home, rural area, to make a living in the cities. They leave the women behind where she then becomes the breadwinner and thus the focus on gender inclusion.

PLENARY SESSION IV

Topic: Reforming the Petroleum Industry in Nigeria

Chairperson: Prof. Oyewusi Ibidapo-Obe, Represented by Prof. Nuhu Obaje

Speaker: Absent

Discussants: Prof. Nuhu Obaje, IBBU, Lapai, Niger State; Dr. M. B. Abubakar, Director, National Centre for Petroleum Research and Development (NCPRD) Bauchi and Dr. Oladiran Fawibe, Nigeria Energy Services Ltd

Rappateurs: Mr. Nasiru Soba and Engr. Umar Adamu Umar, ECN

OPENING REMARKS

The Chairman, Prof. Nuhu Obaje stated that petroleum resources is the number one energy sources in Nigeria; it has dominated almost all the energy sources and it virtually dominated the global economy. He highlighted the fact that the transformation in the petroleum sector is encapsulated in the Petroleum Industry Bill (PIB). He stated that the reform in the Petroleum Industry in Nigeria profoundly involved the exploration and production of oil and gas resources, and its sale in the global market. He emphasized that through the exploration and production activities, Nigeria had acquired a better technology and expressed optimism that soon, we would have additional smaller refineries to boost our refining capacity.

Dr. M. B. Abubakar

He started by explaining why we need the PIB. He stated that the petroleum industry requires a huge investment and expertise and that there are risks associated with oil exploration coupled with political risk. The International Oil Companies (IOCs) and Government need to come up with an agreement, and the law governing the industry must be obeyed. He mentioned that most of the IOCs came around 60s-70s. Therefore we need a global resource institution. He said that the PIB is a controversial issue in the country. He then listed the physical and non physical components of the bill such as; regulatory institution, upstream and downstream petroleum institution, PTDF, PEF, National Petroleum Asset Management Commission, PTF, National Gas Company and PIB. In conclusion, he mentioned that currently, what Nigerian takes home is about 40% of earnings, but with appropriate PIB implementation, the revenue will rise to 90%. Moreover, the Nigerian Hydrocarbon Tax emphasized that the number of barrels explored is dependent on the location of the well (onshore, offshore, frontier basin or shallow) exploration.

Dr. Oladiran Fawibe

Dr. Fawibe from the Nigerian Energy Services Ltd., stated that National Assembly is responsible for harmonizing the PIB. He said that Oil and Gas sector still operates with an act made in 1969 During the Nigerian Civil War under the military regime of General Gowon. He further stated that the PIB has no owner, and there is need to have someone who can go to places such as National Assembly and talk. He equally explained that the PIB should have captured the following three points;

- Institutional Empowerment
- Regulations governing upstream and downstream sectors
- National Content Act is the only way out to resolve the Petroleum Industry Bill (PIB)

CHALLENGES

The following challenges were noted:

- For Inland exploration, there is a burden of evacuating the resources.
- Most of the materials provided are for deep offshore exploration, no provision for inland basins.
- The PIB has to be institutionalized. Currently, most bills are based on personal interest.
- The Petroleum Industry Bill is under The Ministry of Petroleum Resources, this makes exploration weaker.

RECOMMENDATIONS

- There is need for quick human mind and individual attitude for development.
- Comparing Petrobrass and Petronas as in Brazil and Malaysia respectively, a company with such a structure has to be established in Nigeria.

- The institutional set-up is weak. Presently, we don't have any exploration outfit other than NAPIMS.
- A separate Ministry for the implementation of PIB has to be created.

PLENARY SESSION V

Topic: Challenges in the Post-privatization Arena of the Nigeria Power Sector

Chairman: Engr. Kashim. A. Ali, President, COREN

Speaker: Benjamin E. Dikki DG, BPE Represented by Mr. Amechi .C. Aloke

Discussants: Prof. David Segun Aderibigbe; Mr. James Olotu - (MD, NIPP) Represented by Engr. Cyprian Nwachukwu; Mr. Simeon Atakulu, Presidential Task Force on Power

Rappateurs: Engr. George Nosa Osaghae, Mr Tony Lawson and Mrs. Mary Mbazigwe, ECN

Chairperson Opening Remark

- The Chairman, remarks that the purpose of privatizing the power sector is to ensure an improved and sustainable power supply. He charged the discussants to proffer solutions to some of the challenges that we may encounter in the power sector.

Speakers' Presentation:

The Speaker in his presentation said that there was zero funding/investment in the sector between 1988 and 1999; hence, Nigeria energy sector was one of the least viable in the world and yet had too many workers, about 47,713 workers.

The Challenges facing the power sector include

- Monitoring investor's business plans.
- Transmission inadequacy(it needs to be expanded)
- Paucity of skilled manpower
- Water management for hydro-stations
- Gas inadequacy (gas supply to power stations is inadequate)
- Regulation
- High Consumer expectation (unlike telecommunications where consumers were used to no availability of service)
- Security of assets/infrastructure.

Discussants:

- **Mr Simeon Atakulu** - stated that he power sector was faced with a lot of problems prior to the reform era, the issues of vandalism, ineffective management and lack of investment marred the sector efficiency, and this underscored the need to privatize the sector for optimal performance. He however maintained that even after the privatization of the sector, vandalization of power equipment and gas pipeline supplying the power station has continued.
- **Engr. Cyprian Nwachukwu** from (NIPP) in his contribution posited that the post privatization arena has been characterized by non- remittance of bills by electricity consumers and their refusal to key into the prepaid metering system. He went further to say that some users usually bypass the prepaid meters thereby stalling the performance of the sector.
- **Prof. David Adesegun Aderibigbe** revealed that the idea of Bureau of Pubic Enterprise (BPE) establishment was conceived by the NSE then but when it was constituted the society was sidelined by Chief Obasanjo's regime. He further put in perspectives the issues raised in the presentation as it

affects monitoring investors as true but attributed it to non-inclusion of the stakeholders in the process of constituting performance indicator monitory body. He commended both the former presidents, Chief Obasanjo and Jonathan, for their investment in the power sector as it requires a long gestation period to pay off. He also highlighted over-reliance on prepaid meters whose specification is doubtful as a problem faced in the post privatization arena today. He admonished the sector regulator to allow the technical people to have a say in the sector so that it can be moved forward. The non- passage of PIB was also identified by him as a major challenge for investment in the gas to power sector.

Questions and Answers/Contribution Session

The Chairman, Engr. Kashim A Ali asked the following questions:

- What is the place of ECN in the power sector reform as it has over the year been involved in power sector projection study and analyses?
- From consumers' expectation angle, have we moved from where we were to a better situation as regard the power supply?

Engr. John O. Ayodele FNSE; in his contribution said that the labeling of Archaic for all staff of PHCN/NEPA as "Archaic" was incorrect as there are still effectively trained and competent staff of PHCN. They are one of the best in the world.

Prof. U. O. Aliyu in his contribution observed the following:

- Shortage of generation option which needs to be improved.
- DISCOs have not put in place the elementary things such as replacement of broken and obsolete equipment.
- Non-technical losses can only be reduced if we display modern technology.
- Embedded generation will be necessary to reduce the energy gaps, but will require modern protection schemes.

Mr. A.O Aliyu DD EIS ECN

- There should be synergy among energy related government agencies in implementing the National Energy Strategic plans.

Dr. Bridget Obi in her contribution spoke on the challenges of energy efficient appliances. She said that losses on the use of inefficient bulbs and antiquated home appliances continue and the losses need to be arrested. Hence the need to develop gender awareness programs so that women can conserve energy using efficient bulbs and other efficient home appliances. This will go a long way in reducing the loss level.

Dr Umar Bindir DG NOTAP, FMST, in his comments said that we need to state clearly what is going to be done differently in the post privatization era. We need to identify the technologies needed to face the challenges, since the sector is a high technology consuming sector. Why is this? As Einstein said something like if you use the same methods to solve problems that created them in the first place, you will not succeed. Now with the same people in and out of Government running the sector in Nigeria, how can we succeed? The high capital flight out of Nigeria based on this sector should have been one of the issues to be addressed – post-privatization. This was not addressed in the paper.

Discussants:

Engr. Cyprian Nwanchukwu (NIPP)

- The regulatory body should be strengthened to do their jobs effectively especially in the review of tariff system if need be.

Mr Simeon Atakulu

- Former president Obasanjo gave out N2.5billion to boost the sector with about N1.5billion to be invested in the gas sector but it was not well utilized.
- There is no strict compliance to regulations. The NERC regulatory function should be well monitored.
- All hands should be on desk to ensure effective service delivery by the sector by paying bills and report saboteurs to the appropriate authorities.

Prof. David. A Aderibigbe

- We should allow the players in the sector both in Gencos and Discos to operate as the less competent ones with time will be naturally eliminated giving room for more capable ones.

Responses:

- BPE was created in 1988, during the regime of IBB and not by the former President Obasanjo as being mistaken. It is constituted by competent and knowledgeable members of the society as against the belief of a previous speaker.
- The problem that has affected the sector is not the staff but lack of maintenance culture by the past government as the sector was not given attention for fifteen years prior to Third Republic which kick stated the privatization of the sector.
- The players should be supported by all to enable them deliver the expected result.
- We should ensure that the models which worked elsewhere are domesticated in Nigeria taken into cognizance our peculiar factors.

PLENARY SESSION VI

Topic: Challenges in the Regulations of the Nigerian Power Sector

Chairperson: Prof. T. A. Kuku, OAU, Ile Ife.

Speaker: Engr. A. O. Yusuf, NERC

Discussants: Dr. Umar Bindir, DG, NOTAP and Prof. U. O. Aliyu, ATBU, Bauchi

Rappateurs: Mr. Abubakar Yahaya, Mr. U.B. Sudais and Mrs. Mujidat B. Abubakar, ECN

Speaker's Presentation

- ❖ Role of NERC
- ❖ Progress made so far
- ❖ Key challenges
- ❖ Conclusion

Introduction:

In 2000 Government set up Electric power sector implementation committees and the result was the Draft Electric Power Policy. The objectives of the reform was to meet current and prospective demand for

electricity; modernizing and expand service; support economic and social development and attract private investors.

NERC mission is to ensure adequate, safe, reliable power supply by regulating the tariff structures and monitoring licensed operators in the electric power sector. Other issues include the progress made by NERC, gas shortages, consequences of poor electric supply and solutions, transmission issues and metering.

Contribution from Engr. John .O. Ayodele

He said that good regulation is what the Energy Supply Industry (ESI) needs and if not done properly, it spells doom for the industry. Recently tariff was adjusted for zero tolerance on collection thereby pushing 100% collection as a factor. Bearing in mind that the companies inherited a very poor collection mechanism and system, how do you expect them to make the right revenue to justify their cash flow which were made based on different tariff and collection efficiency. Most of these companies are already cash strapped and hope that NERC will review their stand to ensure that companies do not bleed to death.

Comments and Questions

Chief Mrs. A.N Okuribido

(a) Conflict Resolution of arbitration policy by NERC to proffer solution to conflict that may ensue between GENCO and DISCOS.

(b) Reduction and Relaxation of documentation for licenses form NERC for electricity generated from renewable sources.

(c) what is the way forward for the energy sector after this energy summit, are pressure committee formed to follow up decisions or communiqué drafted during this summit?

Dr Umar Bindir, DG NOTAP.

He commended the paper. He said that for adequate power supply we have to generates, transmit and distribute. Marketing and branding, and also sustainability is equally important. He opines that marketing and branding including sustainability should be seriously looked into. He wants Nigerians to design, operate and maintain electrical components. Nigeria is not involved in core electricity research facilities at present. However, gas supply is not our problem in Nigeria but knowledge and research. Hence, regulations need energy experts in the technical and managerial levels. Nigerians have to acquire technology transfer procedures so that we have to produce wires, meters etc for the electricity sector and stop comparing privatization in the electricity and power sectors. We should not be consumption and import country only but seek to produce internally.

Prof. U. O. Aliyu:

He said we have weak infrastructure in Nigeria. Inadequate generation is one problem - generation planning involves knowing the demand projections for up to twenty years (which ECN is providing), this is the very key for the sector to develop. He further said that the Nigerian problem is not regulation but enforcement. The technology is not available in NERC to do post mortem on power failure and without that, we cannot avoid any future reoccurrence. ICT is today integral in power systems as it is worldwide. Contingency helps shore up electrical system failure. Liability matrix is another problem - measuring power supply to consumers should be done by the regulators but unfortunately this job has been left to the DISCOS who are the distributors.

Challenges

1. Regulation is at the heart of the power sector. Wrong and bad regulation spells doom for the sector. A 50% reduction in tariffs spells doom for the cash flow of the companies. Therefore government should not pass the buck to the new companies. NERC should do their homework properly.
2. If a company wishes to generate 50 to 100 megawatts, what special incentives are available for electricity generation from renewable?
3. What form of arbitration exists for issues between GENCOs and DISCOs?

Responses

Engr Yusuf:

- You can visit NERC website for all the explanation on tariff regulation.
- We agree that collection losses should not be passed to consumers
- The commission (NERC) serves as arbitrators between consumers and DISCOs and between GENCOs and DISCOs
- Renewable plants have some hurdles to pass before they can supply to the grid.

PLENARY SESSION VII

Topic: Coal Industry Reform in Nigeria

Chairperson: Engr. Ademola Isaac Olorunfemi, Represented by Engr. John .O. Ayodele

Speaker: Frank Odoom, Deputy Director, Federal Ministry of Mines and Steel

Discussants: **P**rof Oloche, Dean of Engineering, University of Abuja; and DG, Nigerian Geological Survey Agency

Rappateurs: Mr. Idowu Olokungbemi and Mr. Alhassan Musa, ECN

Speaker Presentation

The speaker highlighted the following issues:

- Coal was first discovered in 1909 near Udi, Enugu State and coal production started in 1916. Oil discovery led to reduction in the exploitation of coal in Nigeria. The coal industry received a reformation in 2005. Coal resource as at today is about 1487million tonnes in Nigeria. Today, coal exists in 15 states in Nigeria.

Some of the challenges in the Coal industry are:

- Environmental pollution from coal. High cost of clean coal technology and paucity of investors in the coal industry

He concluded that Nigeria has a large coal deposit and that there is need to put in place a policy and legal framework for coal exploitation.

Discussions

Prof. Oloche commented that coal was a viable source of energy in the past as it was used to drive electricity in form of coal fired plant and transportation(trains), but was later abandoned on discovery of oil despite his large deposit. The R & D of coal in universities should be strengthened and the result should be put to action so that the sector can be revived.

DG, Nigerian Geological Survey Agency, in his own comment, said the various moribund coal mines across Nigeria should be exploited as it is capable of generating the required megawatts needed for electricity generation in Nigeria

Question and Answers

Question: Prof. Aliyu, ATBU Bauchi asked if the license issued for coal can be used for other mining.
Answer: Mr Frank Odoom pointed out that he is not aimed with the conversion factor at present. Responding to the issue of licensing, he maintained that mining license is usually specific; he said coal mining license cannot be used for other mining; however, provision can be made for such on request.

Question: The Chairman, Engr. John O Ayodele, asked if coal mining can be done where human beings live.
Answer: Mr. Frank Odoom enlightened the entire house that coal mining is not advisable where human beings live, it should be done from other locations.
Question: The Director General, Energy Commission of Nigeria, Prof E.J Bala asked about the position of Tar Sand and Bitumen. Are there investors?
Answer: Mr. Frank Odoom gave a brief update on Tar Sand and Bitumen, and said it's in the process of being advertised as it has been broken down into blocs from Lagos to Enugu to ease the process.

PLENARY VIII

Topic: Energy Financing in Nigeria

Chairman: Mr. Mustapha Alhaji, UNIDO

Discussants: (1) Elder Boma Binebo, Director, Development Finance, CBN; (2) Mr. Joseph Babatunde, Bank of Industry; (2) Yesufu Alonge, Nigerian Bulk Electricity Trading Company.

Rappateurs: Mr. Nafi'u Tijjani and Engr. Ms. Alaere Matholo, ECN.

Mr. Mustapha Alhaji, Chairman:
He commended the Energy Commission of Nigeria for organizing the 2015 National Energy Summit. He said that all planning need finance. CBN, BOI are working hard to see that there is no financial problem in the power sector and the CBN intervention in the power sector is handled by BOI. In this respect, energy financing cannot be compromised, Nigeria is generating less than 5,000MW with about 170 million population while South Africa with population of about 50 million are generating 40,000MW leaving Nigeria behind. If we are looking at our population growth, then energy financing is necessary in Nigeria. The integrated master plan indicates that, N125billion is needed for financing energy in Nigeria. Since 2005 when the Electricity Sector Act Reform come into existence we have not seen serious financing in the energy sector. Gas Pricing has also been liberalized, although the NNPC, CBN and PHCN met and agreed that, gas price cap be removed.

Elder Boma Benabo

- CBN is ensuring low-cost long-term energy financing. Although, the CBN knows the location of the coal resources in the country but do not know the specific areas of coal deposits.
- Energy financing by CBN is based on integrated master plan and is concerned with hydro and thermal energy production.

- CBN catalyzed proper gas pricing for PHCN and NNPC. PHCN purchased gas from gas producing companies but do not pay always. Therefore, the debt is always settled by CBN since most of these companies are foreign gas generating companies. Presently, CBN has committed N213billion to the energy sector.
- CBN always identify the gas Gencos and PHCN are owing and subsequently pay off the gas debts. CBN also strengthen the Bank of Industries so that it finances captive power supply.

Discussions

Mr. Babatunde Joseph, Representative of MD BOI

- He stated that, power is very important especially in the manufacturing sector of this country and the financing energy is very cost effective, it's very high risk area of investment considering its long gestation period, due to change in governments and policies .
- We must be looking at multi power approach, i.e. we should consider renewable energy in the financing system.
- Most of the power captive projects are completed and they are needed in the cement and sugar industries. The energy loss is due to lack of energy financing. The BOI collaborate with UNDP to enhanced power supply from renewable energy sources.

Mr. Yesufu Alonge, Representative of MD NBET

- He stated that as a nation we need to develop, thus financing energy is imperative. Looking at the privatization of PHCN, creating right institution is the one of the basic necessity. Privatization brings about confidence in the power sector.
- The investors have the money, but are not very sure on how to recover their money. Government must assure investors on how to recover their money in the event of any eventuality. Assurance is important in energy financing and the proposal has to be adequately explained, since there are a number of projects on ground waiting for financing. For example, Egbin Power Plc has six power plants, only four plants are working, one is completely down and government is adamant to take it for refurbishment.

Comment / Observation

Government should back out of energy financing since private investors are just adequate on delivery, so that exploitation through government purchase will reduced and funds will be redirected to better use.

Questions

Barrister A. Y. Elamah: (1) We always talk of pension fund when we are faced with financial problem, knowing the volatility of the pension funds, and based on our past experience, there are many institutions that can finance the power sector, such as African Development Bank, IMF and other banks.

(2) National Grid is so wide, why don't we allow each state to legislate on matter of power to allow them to wholly attend to their needs?

Answers:

Mr. Yesufu Alonge responded by saying that the power sector has been liberated, that is why Lagos State can generate power for the use of its citizen.

Question:

(3) Mr. Chima Muoneke**,** Federation for the Sensitization on Electricity, Power Conservation and Safety: If a DISCO signs a bilateral agreement with an IPP that has to go through the 330/132 KVA lines within which the NBET operates, will NBET get involved?

Answers:

The NBET acts as intermediary between Gencos and Disco. NBET does not really trade but rather transfer the power generated by Gencos to Discos which attract some administrative charges. The NBET according to the law setting it up will seize to exist in a period of 7 years after the Discos are satisfied strong enough to engage the Gencos directly.

Question:

(4) Mr Chima Muoneke: The CBN intervention fund of N213 Billion was for gas debt and revenue shortfall, how can NBET get fund to finance its PPA in case of default?

Answer:

The CBN achieves this by ensuring that the power purchase agreement is put in place before giving out money. It always ensure that security is met so as not to lose out in case of defaulters.

Question:

(5) Prof. Usman O. Aliyu, ATBU, BAUCHI: What is the average cost of a solar project?

Answer: N40 Million was projected to erect a stand-alone solar power plant for twenty houses.

The summit ended with a communiqué read by DG/CEO of Energy Commission of Nigeria.

2. CONFERENCE ON SOLAR ENERGY AND ECONOMIC TRANSFORMATION IN NIGERIA (NATIONAL SOLAR ENERGY FORUM & EXHIBITION (NASEF 2015)

The Conference on Solar Energy and Economic Transformation in Nigeria tagged "National Solar Energy Forum and Exhibition (NASEF 2015)" was held at Reiz Continental Hotel, Abuja on 6th and 7th May 2015. The Conference was jointly organized by the Energy Commission of Nigeria, the Solar Energy Society of Nigeria (SESN) and the Associatin of Solar Energy Practitioners of Nigeria (ASEPN).

The Conference had the following objectives:

- To address both current and anticipated challenges of the solar energy sector affecting or likely to slow down the pace of achieving the Transformation Agenda;
- Review the Energy System and Policies in Nigeria to be compatible with Federal Government's Transformation Agenda and other Government Policies;
- Assess the effectiveness of existing policies in achieving the energy component of and contribution to the Transformation Agenda and vision 20:2020 in order to move the country towards a more Sustainable Energy Future;
- Generate ideas that will help steer the development of the Nigeria energy sector on the path of sustainability.

The opening ceremony was chaired by the President of the Nigerian Society of Engineers, Engr. Ademola Isaac Olorunfemi. It was attended by professionals from Universities, Energy Research Centres and practitionals from private industries. Many dignitaries from Ministries, Departments, Agencies (MDA's) and Civil Societies were also in attendance. The was an exhibition by the Association of Nigerian Solar Energy Practitioners (ANSEP) Two keynote addresses were given by Dr. Umar Bindir, DG, NOTAP and Mr. Robert Foster, WINROCK International /USAID. The DG, NOTAP, Dr. Umar Bindir painted a vivid picture of our state of technological development in his captivating keynote address titled: "Renewable Energy Development in Nigeria". He pointed the direction our nation should take in Science, Technology and Innovation. There were also goodwill messages from Ministry of Power, Water Resources, Environment, Agriculture, and Rural Development, Finance, ANSEP, NASENI and Development partners like JICA, GIZ, GEF, UNDP, UNIDO.

During this year's conference, the Solar Energy Society of Nigeria (SESN) awarded thirteen Fellows to distinguished individuals and four Awards of Excellence to deserving organizations. The Awardees include the following:

A. FELLOWSHIP AWARDS

S/N	Names	SESN NO
1.	Dr. Abdul Bulama, The Honourable Minister of Science and Technology	
2.	Prof. (Sir) Ita Okon Bassey EWA, former Honourable Minister of Science and Technology	
3.	Dr. Umar Buba Bindir, Director General/CEO, National Office for Technology Acquisition and Promotion (NOTAP)	
4.	Prof. Sulaiman Elias Bogoro, Executive Secretary, TETfund	
5.	Engr. Dr. Mohammed Sane Haruna, FNSE, FIET,FNATE, Executive Chairman/Chief Executive Officer, National Agency for Science & Engineering Infrastructure (NASENI)	
6.	Prof. Lawal Sulaiman Bilbis, Vice Chancellor, Federal University, Birnin-	

	Kebbi, Kebbi State	
7.	Prof. Chigozie C. Asiabaka, KSM, JP, Vice Chancellor, Federal University of Technology, Owerri	
8.	Engr. Prof. Adisa A. Bello. National Chairman, Nigerian Institution of Mechanical Engineers, (NIMechE)	
9.	Prof. Peter Ikechukwu, Department of Physics and Industrial Physics, Nnamdi Azikwe University, Awka	
10.	Dr. Paulinus Ekene Ugwuoke, Director National Centre for Energy Research and Development, Nsukka	
11.	Engr. Abubakar Isa, Managing Director, Spectrum Engineering	

B. SPECIAL HONOUR AWARDS

S/N	Name	SESN NO
1.	Spectrum Engineering	
2.	Rubitec Nig. Limited	
3.	Solar Electric Systems Limited	
4.	Straightforth Energy Solutions Limited	

In order to create awareness of solar energy and renewable energy in general, the SESN organized a Pre-conference quiz competition amongst Secondary Schools in the FCT, in the field of renewable energy. The following Secondary Schools emerged as winners of the quiz competition and were awarded prizes during the opening ceremony:

C. AWARD OF PRIZES TO WINNERS OF THE QUIZ COMPETION

Position	Name of School	Solar Project	Prizes
1st	JSS, Pasali, Kuje Area Council	Solar Oven	
2nd	JSS, Tukpechi, Kuje Area Council	Biomass Cooker	
3rd	JSS, Nyanya, Abuja	Fuelless Electricity Generator, (Battery to Battery Charger)	
No Prize	JSS, Kubwa III	Power Inverter	

After the ceremony, members were taken through the exhibition mounted outside by NASENI, Solar Electric Systems Limited, Rubitech Limited, Straightforth Energy Solutions Limited and Spectrum Engineering.

The Technical Sessions were successfully conducted and papers were presented on the following sub-themes:

- Solar Photovoltaics, Solar Cells and Thin Films
- Solar Thermal Devices, Solar Dryers and Solar Water Heaters
- Environmental aspects of Energy
- The Role of Solar Energy in a Liberalized Electricity Market
- Renewable Energy Policy, Planning and Legislation
- Solar and Micro Grid system
- Energy Efficiency and the Green Building
- Green Energy for Climate Change Mitigation
- Bioconversion and Waste to Energy, Biogas and Biofuels
- Wind Power and Small Hydro Power
- Renewable Energy Financing

OPENING CEREMONY AND SPEECHES

ADDRESS BY THE CHAIRMAN OF THE OPENING CEREMONY AND PRESIDENT, NIGERIAN SOCIETY OF ENGINEERS, ENGR. ADEMOLA ISAAC OLORUNFEMI, AT THE 2015 NATIONAL SOLAR ENERGY FORUM (NASEF 2015), HELD AT REIZ CONTINENTAL HOTEL, ABUJA ON 6TH – 7TH MAY 2015

PROTOCOL

I am pleased to be invited to chair the opening ceremony of the 2015 National Solar Energy Forum organized by the Solar Energy Society of Nigeria, Energy Commission of Nigeria (ECN) and the Association of Nigeria Solar Energy Promoters. May I welcome other invited guests and participants to this Forum with the theme "Solar Energy and Economic Transformation". I am aware that solar energy can be transformed directly into electrical and heat energies through well established technologies. Sunlight is also necessary for the production of biomass and feedstock for fossil fuel evolution, wind, hydro, etc. All these are resources that can be transformed into final energies of electricity, fuel or process heat essential for economic transformation. These final energies should, however, be derived and utilized efficiently in the economy.

It is therefore not surprising that NASEF 2015 has the following sub-themes:

- The Role of Solar Energy in a Liberalized Electricity Market
- Solar and Micro Grid System
- Energy Efficiency and the Green Building
- Bioconversion and Waste to Energy
- Wind Power and Small Hydro Power

I gather that NASEF 2015 is expected to bring together government, industry and academia to discuss and profer way forward on how solar energy and other renewable energy sources can best contribute in transforming the economy of our nation. I am also informed that the Solar Energy Society of Nigeria (SESN) has featured its flagship programme, during NASEFs, of conducting Science Quiz Competitions to secondary schools students on renewable energy. This time, it was conducted on FCT Senior Secondary School Students; and awards are to be made during this opening ceremony. I am also aware that there will be an exhibition of Solar Energy Technologies by the Association of Nigeria Solar Energy Promoters (ANSEP) at the end of the opening ceremony. I would therefore like to crave your indulgence and patience as we go through these activities.

After the exhibitions and subsequently, parallel technical sections would be held, where technical and scientific papers are expected to be presented on subject matters relevant to the theme of this year's Forum. It is my hope and prayer that the output of the presentations would guide government further in the integration of solar energy and other renewable energy sources for economic transformation.

Finally, may I at this juncture congratulate the organizers and to wish participants fruitful deliberations. Thank you.

President, Nigerian Society of Engineers

WELCOME ADDRESS BY THE CHIEF HOST AND DIRECTOR GENERAL, ENERGY COMMISSION OF NIGERIA, PROF. E.J. BALA, AT THE OPENING CEREMONY OF 2015 NATIONAL SOLAR ENERGY FORUM (NASEF 2015), 6TH MAY 2015, REIZ HOTEL, ABUJA

PROTOCOL

I welcome you all to this opening ceremony of the National Solar Energy Forum 2015 (NASEF 2015), organized by the Solar Energy Society of Nigeria in collaboration with the Energy Commission of Nigeria and the Association of Solar Energy Promoters of Nigeria. I particularly welcome the Special Guest of Honour and Honourable Minister of Science and Technology, Dr. Abdu Bulama; the Chairman of this occasion, Engr. Isaac Ademola Olorunfemi, FNSE, who is also the President of Nigeria Society of Engineers; the keynote speaker, Dr. Umar Bindir, who is the Director General of NOTAP; Development Partners present; and invited distinguished guests. We thank you all for finding time to honour our invitation.

Indeed, any forum on energy usually attracts large participants and attention because energy plays a very crucial role in socio-economic and industrial development of any nation. Therefore energy from energy source and in any form is a commodity often sought after. Energy from the sun, in particular, is very important from the fact that the sun and its energy are known to be instrumental to the formation of fossil fuels and other renewable energy sources with the exception of geothermal energy. Solar energy, which is generated through thermo-nuclear process within the sun, is in the form of electromagnetic radiation. The energy is environmentally friendly and can be directly transformed into electricity or heat, as the case may be, for sustainable transformation of the economy with minimal or no GHG emissions. Nigeria is endowed with solar energy intensities of between 3.5kWh/m^2/day and 7.0 kWh/m^2/day and therefore has good potentials for the production of electricity and heat energies.

It is in recognition of this potential and the desire to diversify our energy supply mix for energy security, amongst other factors, that the Federal Government pronounced in the National Energy Policy that the *"Nation shall aggressively pursue the integration of solar energy into the nation's energy mix, which should be based on the established potentials and available technologies nationwide"*. The Federal Government also went ahead to establish Energy Research Centres with mandates of conducting research and development in solar energy and other renewable energy sources under the auspices of Energy Commission of Nigeria. It is delighting to report that due to efforts of government, NGOs such as the Solar Energy Society of Nigeria, and Development Partners, the utilization of solar energy in Nigeria has risen from its rudimentary form in the open-to-sun drying of agricultural produce for subsistence living in 1914 to more modern use for lighting and water pumping at installed capacity of about 300kWp in 1999. By 2014, solar PV installation had risen to about 30MWp capacity, dispersedly utilized for water pumping, street lighting, mini-grid, vaccine refrigeration, traffic lights etc. Studies by the Energy Commission, using modern energy planning tools, indicate that electricity from solar energy is expected to grow to about 50GW by 2030; contributing about 17% of total electricity supply capacity, in the Nigerian economy, growing at double digit.

Solar energy is however known to be naturally intermittent and therefore requires storage to enable it be dispatchable. Secondly, cost of technologies for transforming sunlight into final energy is relatively more expensive than other technologies; though costs are being driven downwards by intensive R&D. Therefore, I request the forum to inter alia, look into the challenges of storage, adoption of appropriate

solar technologies at least cost, capacity building and de-risking solar energy so that it may easily make its contribution in transforming the Nigeria economy.

Finally, Mr. Chairman, Honourable Minister, distinguished invited guests, ladies and gentlemen, I once again welcome you all and wish the Forum fruitful and rewarding deliberations.

Director General/CEO
Energy Commission of Nigeria

TECHNICAL SESSIONS: KEYNOTE ADDRESS

RENEWABLE ENERGY DEVELOPMENT IN NIGERIA – A Keynote Address Delivered to the SOLAR ENERGY SOCIETY OF NIGERIA (SESN)

PROTOCOLS & APPRECIATIONS..!

Engr Umar B. Bindir *PhD (Cranfield)* ©!
FNAEng; FNSE; FNIAE;!
DIRECTOR GENERAL/CEO, (ubindir@yahoo.com)!

INNOVATION OFFICE FOR NIGERIA

RENEWABLE ENERGY DEVELOPMENT IN NIGERIA!

A PRESENTATION AT THE SOLAR ENERGY FORUM & EXHIBITION (NASEF)!
THEME: SOLAR ENERGY and ECONOMIC TRANSFORMATION!

6TH MAY 2015

RENEWABLE ENERGY DEVELOPMENT
"A TECHNOLOGY ACQUISITION PROCESS"!

- **HIGH-TECH VALUE CHAIN!**
- **GENERALLY:!**
  - **SCIENCE!**
  - **TECHNOLOGY!**
  - **INNOVATION!**

GLOBAL PERSPECTIVE!
!
THE LOGIC OF STI INITIATIVES FOR DEVELOPMENT!
!
A 3-STAGE PROCESS!

GOALS

1. **Absolute poverty** is **totally eradicated**!
2. Every man, woman, and child in the Country should **have access**, **not just to basic minimum needs, but to all the opportunities** to lead a happy, safe and fulfilling life!
3. Country **emerges** as a **knowledge and a learning society** built on values of ***hard work, honesty, discipline, sincerity…***!
   - *WORLD CLASS INSTITUTIONS*!
   - *GLOBAL PRODUCTS & KNOWHOW*!
   - *INNOVATIVE*!

BUT…

World 3 (the third world) refers to those countries – Bangladesh and Nigeria are examples – that are in severe straits *with no clear path to a positive future* !

!

***Source*: 21st Century Technologies: Promises and Perils of a Dynamic Future, OECD 1998, Ch. 2, page 34!**

TRUTH OF THE MATTER ??

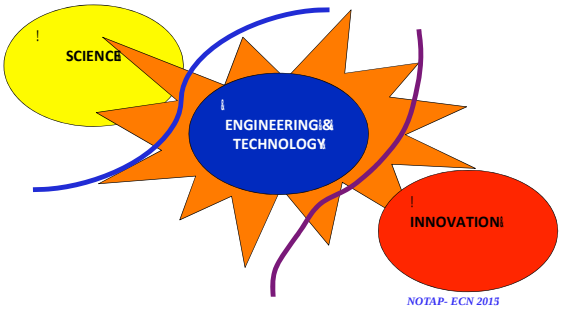
SUSTAINABLE DEVELOPMENT "RENEWABLE ENERGY"??

DEPENDS ON THE VIBRANCE, CONNECTIVITY AND EFFICIENCY OF THE

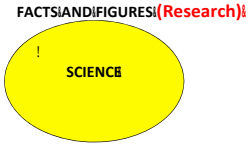
SCIENCE, TECHNOLOGY & INNOVATION SYSTEM

THIS IS THE MASTER KEY

UNDERSTANDING THE STI VALUE CHAIN IS NECESSARY



SCIENTIFIC CAPACITY



Ability to study, generate knowledge, discover, conceive possibilities, document, explain, communicate, publish…

RESEARCH

- **SPECIALISTS (SCIENTISTS)**
- **HIGHLY TRAINED AND QUALIFIED**
- **LONG TERM INVESTMENTS**
- **EXPENSIVE TOOLS AND FACILITIES**
- **HIGH MOTIVATION**
- **etc**

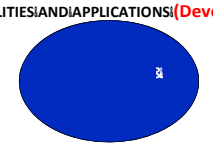
RESEARCH (S)

- **RESEARCH INFRASTRUCTURE (Labs & Equipment)**
- **WORLD CLASS PUBLICATIONS/PhDs/PROFESSORS)**
- **HIGH IMPACT/CITATION/ACADEMIC PARTNERSHIPS…**
- **RELEVANCE?**

HIGH LEVEL, QUALITY KNOWLEDGE (S)

ENGINEERING CAPABILITY!

POSSIBILITIES\AND\APPLICATIONS\(Development)&



Ability to transform knowledge (S) into applicable socio-economic solutions and assets) !

TECHNOLOGY!

- **TECHNOCRATS (ENGINEERS, ARTISANS…. OTHERS)!**
- **HIGHLY SKILLED IN TRANSFORMING KNOWLEDGE!**
- **PROOF OF CONCEPTS ON PRODUCTS AND PROCESSES!**
- **PRODUCTION PROCESSES INFRASTRUCTURE!**
- **PROTOTYPES AND PILOT PLANTS!**
- **TECHNOLOGY SERVICES!**
- **RELEVANCE ?!**

TECHNOLOGY (IP)..!

HIGH LEVEL, QUALITY KNOWLEDGE (S)

↓

KNOWLEDGE, PUBLICATIONS AND PhD$

↓

INTELLECTUAL PROPERTY-IP (T)

???...!

PROTECTED TECHNOLOGY (IPR)

HIGH LEVEL, QUALITY KNOWLEDGE (S)

↓

KNOWLEDGE, PUBLICATIONS AND PhD$

↓

INTELLECTUAL PROPERTY-IP (T)

INDUSTRIAL PROPERTY! **COPIABLE PROPERTY!**

LEGAL OWNERSHIP (R)! **(IPR)**

IPR

1. INDUSTRIAL PROPERTY RIGHTS!

- PATENTS PAT. !
- TRADE MARKS ™!
- INDUSTRIAL DESIGN ®!
- TRADE SECRETS!
- HIGH LEVEL KNOW HOW!
  - TECHNICAL SKILLS!
  - MANAGERIAL SKILLS!
- etc!

IPR..!

2. COPYRIGHTS ©!

- CREATIVE EXPRESSION!
- LITERARY!
- MUSIC!
- SOFTWARE, MAPS!
- DATABASES!
- PLANT VARIETIES!
- GEOGRAPHICAL INDICATORS!
- TRADITIONAL KNOWLEDGE!
- LAYOUT DESIGN!
- etc!

IPR…!

HIGH LEVEL, QUALITY KNOWLEDGE (S)

↓

KNOWLEDGE, PUBLICATIONS AND PhDs

↓

INTELLECTUAL PROPERTY-IP (T)

↓

INDUSTRIAL PROPERTY! COPIABLE PROPERTY!

↓

LEGAL OWNERSHIP (R)! (IPR)

↓

LIABILITIES

IPR…!

HIGH LEVEL, QUALITY KNOWLEDGE (S)

↓

KNOWLEDGE, PUBLICATIONS AND PhDs

↓

INTELLECTUAL PROPERTY-IP (T)

↓

INDUSTRIAL PROPERTY! COPIABLE PROPERTY!

↓

LEGAL OWNERSHIP (R)! (IPR)

↓

LIABILITIES ASSETS! (TT)

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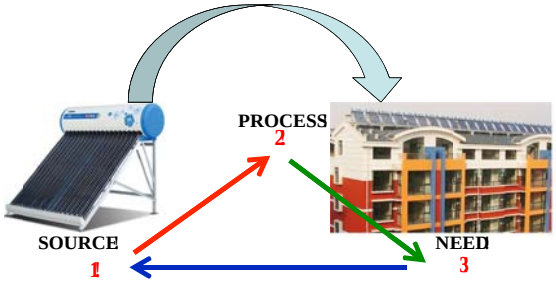
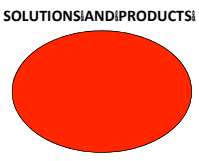
TECHNOLOGY (IP) TRANSFER (Skill)



TECHNOLOGY TRANSFER PLATFORMS??

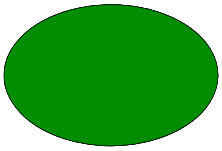
- SELF ACTUALISE!
- OUTRIGHT SALE!
- LICENSING!
- JOINT VENTURE!
- FRANCHISE (BUSINESS)!
- GIFT!
- etc etc !

INNOVATION & ENTREPRENEURSHIP!



DYNAMIC DEPLOYMENT OF SOLUTIONS TO COMPETITIVELY SUSTAIN SOCIO-ECONOMIC RELEVANCE

INNOVATION & ENTREPRENEURSHIP!



Creative skills and trait of using proven and tested solutions to provide goods and services efficiently for very clear benefits!

…COMMERCIALISATION!

- **FEASIBILITY, FINANCING, TRAINING!**
- **IP MANAGEMENT & LICENSING!**
- **BUSINESS PLANNING/ MANAGEMENT!**
- **PRODUCTION, BRANDING, MARKETING…..!**

…COMMERCIALISATION!

- **PRODUCTS!**
- **PROCESSES!**
- **KNOW-HOW SERVICES (Consultancy etc)!**
- **INDUSTRIAL SKILLS!**
- **MANAGERIAL SKILLS!**

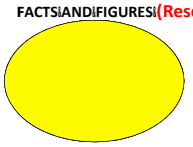
APRAISAING THE *STI SYSTEM IN NIGERIA*

STI INFRASTRUCTURE (SUPPLY)!

- 140 Universities (40:39:61)!
- 125 Mono-Polytechnics!
- 98 COE!
- Over 300 Research Institutions/Centres!
- World-class Industries!
- Large pool of high class capacities (Professors, PhDs, Professional bodies, Diaspora capacity)!
- Research capabilities (Labs, Workshops, Libraries)!
- LARGE NUMBER OF EXISTING NETWORKS!

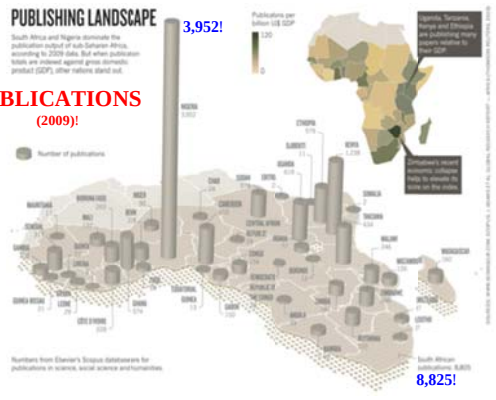
RESEARCH OUTPUT!

FACTS!AND!FIGURES!(Research)!



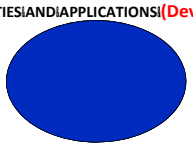
RENEWABLE ENERGY RESEARCH!

PUBLICATIONS (2009)!



DEVELOPMENT "POTENTIAL" (T)!

POSSIBILITIES!AND!APPLICATIONS!(Development)&



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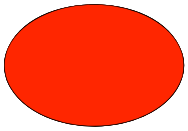
INNOVATION "OPPORTUNITIES" (I)!

SOLUTIONS AND PRODUCTS



SCIENCE KITS

DESPITE THESE OUTPUTS, CREATIVITIES AND INNOVATIONS ON THE GROUND……

THE REALITIES???

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ION!

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WATER SUPPLY

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TOOLS OF TRADE

NOTAP- ECN 2015

NOTAP- ECN 2015

STAPLE FOOD

NOTAP- ECN 2015

NOTAP- ECN 2015

CHALLENGES OF YOUTH UNDER EMPLOYMENT!

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Cottages & SME$

NOTAP- ECN 2015

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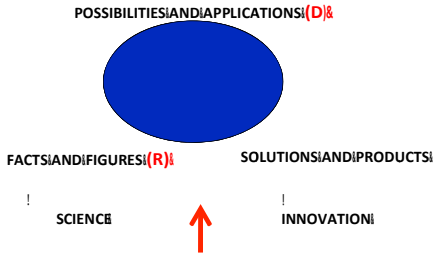
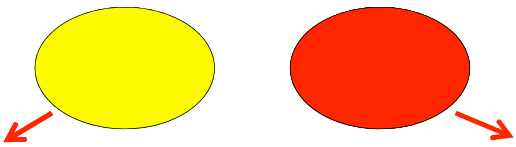
THE LIST IS LONG!!!

THE FUNDAMENTAL HIDDEN CHALLENGE????

(PRACTICAL!!)

REAL POSTURE OF THE NIGERIAN STI!



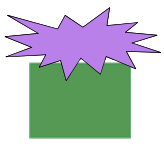


REAL POSTURE OF THE NIGERIAN STI!

THE VALLEY OF DEATH

KNOWLEDGE!

MARKET!

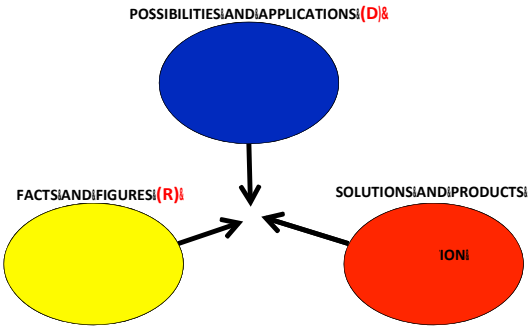


WHAT TO DO

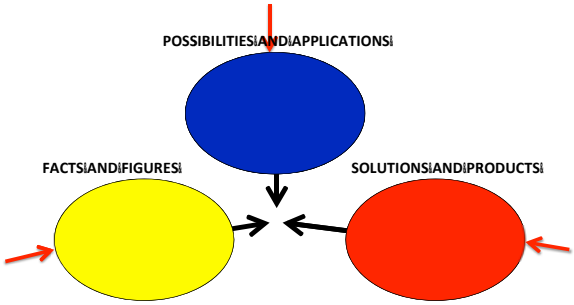
TO

OVERCOME???

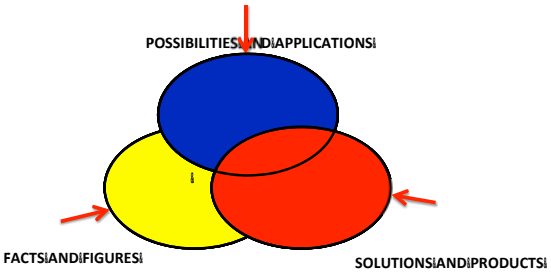
NETWORKING THE STI ELEMENTS!



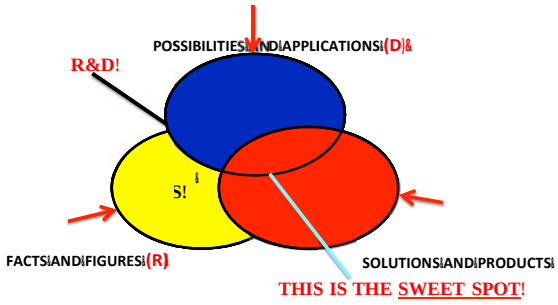
STI GOVERNANCE!



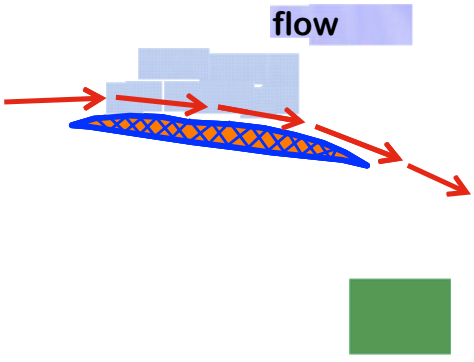
STI POLICIES!



UNLEASH THE KNOWLEDGE ENERGY!



PROACTIVE STI POSTURE!



WE CAN T SOLVE PROBLEMS BY USING THE SAME KIND OF THINKING USED WHEN WE CREATED THEM !

ALBERT EINSTEIN (German Born American Physicist 1879 – 1955)

LITERAL SHOCK-TREATMENT TO CREATE A FUNCTIONAL STI SYSTEM…BY..!

TRANSFORMED GRADUATES
(UNIVERSITIES, POLYTECHNICS, RIs….)

- TRAINING CENTRES/SCHOOLING!
- R&D AND EXPERIMENTATION CENTRES!
- PRODUCTION AND INDUSTRIAL CENTRES!
- ENTERPRISES WHO NEEDS TO SELL THEIR PRODUCTS TO SURVIVE!
- COLLABORATORS NATIONALLY AND INTERNATIONALLY!

SKILLS & KNOW-HOW STRATEGY!

HUMAN CAPITAL!
- INNOVATIVE ENTREPRENEURS!
- HIGH VALUES!
- KNOW - HOWS!
- MANAGERIAL SKILLS!
- ORGANISATIONAL SKILLS!

SKILLS & KNOW-HOW STRATEGY!

RECOGNISE ENVIRONMENTAL CAPITAL!
- THE VALUE AND POTENTIAL OF THE NATURAL ENVIRONMENT (OPPORTUNITIES)
- THE SUN, CLIMATE, RIVERS, SEEDS, INSECTS, FOODS, etc!
- ORGANISE TO PRODUCE, PROCESS, COMMERCIALISE EFFECTIVELY!
- LITERALLY TO CREATE JOBS AND WEALTH!

SKILLS & KNOW-HOW STRATEGY!

SOCIO-CULTURAL/INTERPERSONAL CAPITAL!
- TO NETWORK AND CREATE STRONG CONNECTIONS!
- TO SHARE KNOWLEDGE, EXPERIENCES, DIFFICULTIES, OPPORTUNITIES!
- TO NEGOTIATE, DISCUSS AND WORK JOINTLY!

SKILLS & KNOW-HOW STRATEGY!

TECHNICAL CAPITAL!
- TO INVESTIGATE, DISCOVER, DEVELOP, INCORPORATE AND INTEGRATE INNOVATIVE TECHNOLOGIES!
- USE NEW TOOLS, NEW MACHINES, NEW PROCESSES, PRODUCTION TECHNIQUES!
- ALL TOWARDS IMPROVEMENT OF PRODUCTIVITY (DEVELOPMENT)!

SKILLS & KNOW-HOW STRATEGY!

FINANCIAL CAPITAL!

- **TO BETTER MANAGE FINANCES!**
- **TO START, COMPLETE & SUSTAINABLE PROJECTS!**
- **etc!**

HELIX OF EFFICIENT DEVELOPMENT DELIVERY!

GOVERNMENT! (LEADERSHIP)!

- **POLITICAL!**
- **ECONOMIC!**
- **MORAL!**
- **TECHNOLOGICAL!**

SUSTAINABLE NATION BUILDING!

INDUSTRY/ENTERPRISE! **KNOWLEDGE (SETI)!**

ENERGY!

FARMING INPUTS!

SMALL!

MEDIUM AND LARGE!

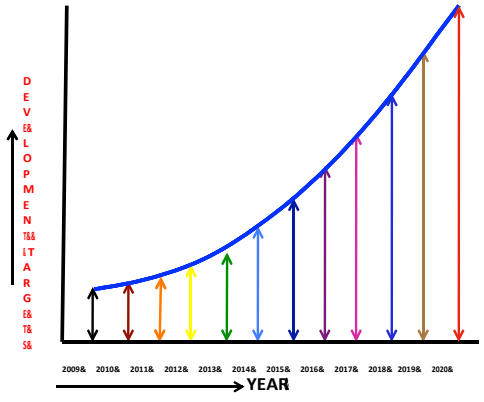
MANUFACTURING

WE MUST CHANGE!!!!

- CHANGE STRATEGY (no business as usual)!
- MATCH WORDS WITH ACTIONS!
- LEAD AND FOLLOW WELL!
- BE LOGICAL AND STRATEGIC!

THESE ARE ALL POSSIBLE!!

20P2020



CONCLUSIONS

IF WE WHAT TO DO IT RIGHT!

- National Policies (evidence based, practical, implementable and measurable) on moving ALL SECTORS forward in synergy !
- Vibrant Science, Technology and Innovation (STI) system!
- Institutional Systems of Innovation (NSI)!
- Sustained Research and Development (R&D) Investment!
- If Raw Material Endowed, downstream value addition!
- Prioritised Technology Acquisition Focus and Mentor !
- Strong Intellectual Property (IP) system!
- Innovative, Deliberate and Intense Deployment of ICT!
- Viable Research - Industry Linkage models!
  - Hi-Tech companies, Efficient Technology Incubation, Science and Technology Parks, Research Parks, Innopolis, Technopolis etc!
- etc!

RECOMMENDATION (1)

TAKE ADVANTAGE AND PROPERLY COOPERATE TO PROMOTE NIGERIAN TECHNOLOGIES AND INNOVATIONS (STI OUTPUTS)

REGULAR INSTITUTIONAL EXHIBITIONS & TECHMARTS

(ZONAL, NATIONAL, REGIONAL & INTERNATIONAL)

RECOMMENDATION (2)

***TRANSFORM* AND TAKE A DELIBERATE MASS EMPLOYMENT GENERATION AND WEALTH CREATION POSTURE**

RECOMMENDATION (3)

BUILDING THE CRITICAL MASS OF ENTREPRENEURIAL MANPOWER STRATEGICALLY *(USE TECHNOLOGY CONTRACTS TO LINK ACADEMIA TO INDUSTRY)*

RECOMMENDATION (4)

THINKING OUT OF THE BOX

TO LINK RESEARCH TO SOCIO-ECONOMIC DEVELOPMENT!

ESTABLISH & MANAGE SCIENCE AND TECHNOLOGY PARKS

GLOBAL EXPERIENCES

•INTEL!
•ERICCSON!
•etc!

Located near Durham, Raleigh, and Chapel Hill, in the Research Triangle region of North Carolina.!

RECOMMENDATION (5)

GRADUALLY DEVELOP VIABLE AND VISIBLE PARTNERSHIPS

NOTAP- ECN 2015

FRIESLAND CAMPINA WAMCO Nig Plc

MILK !

NOTAP- ECN 2015

NOTAP- ECN 2015

NOTAP- ECN 2015

NOTAP- ECN 2015

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NEXT LEVEL?!

NOTAP- ECN 2015

NOTAP- ECN 2015

NOTAP- ECN 2015

NOTAP- ECN 2015

RECOMMENDATION (6)

STRATEGIC NATIONAL POSTURE

AGENDA 1777

!

A GENERIC POST-2015 DRIVE

1777

WHAT ?

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ONE UNITED NIGERIA (1)!

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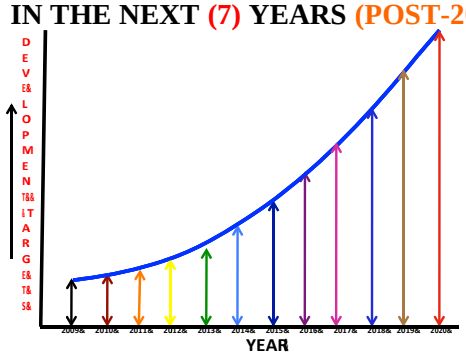
NOTAP- ECN 2015

1777

IN THE NEXT (7) YEARS (POST-2015)!



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1777

GLOBAL PRODUCTS - (7)

1. UNIQUE FOODS - **pomo**, garri!
2. BIO-RESOURCE FRANCHISE – Red goats, mushroom, fish!
3. HEALTH (Niprisan sickle cell drug - sorghum)!
4. BASIC EDUCATION (Science lab & lab kits),!
5. ICT Innovations (Alluha, Tele-medicine, Tele-education)!
6. HOUSING (Equipment and Houses)!
7. SPORTS (football, boots, electronics, foods)!

1777

BUILDING (7) MNCs

(KNOWLEDGE CONTROL & HIGH WAGE EMPLOYMENT)

BUILDING (7) NIGERIAN MNCs
(WHY NOT? SOME EXAMPLES!!)

1. **DANGOTE** – Materials, inputs, food, etc!
2. **GLO** – Communications!
3. **ZINOX** – ICT Hardware innovations!
4. **CWG** – Software and IT Services innovations!
5. **BIO-ORGANICS NUTRIENTS** – Food fortification and food security!
6. **WELTEK** – Oil and Gas Engineering!
7. **INNO/AUTOBAHN**– Affordable Automobiles!

RECOMMENDATION (7)

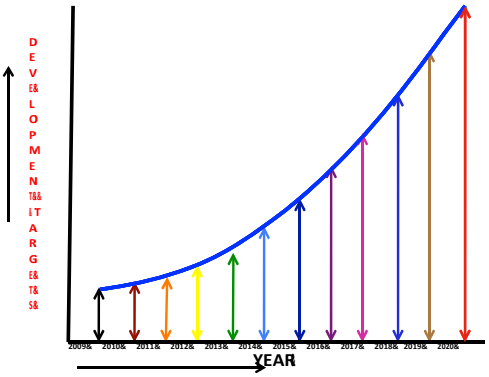
THE NEW STI POLICY!

(7)

(i) ESTABLISH AND TAKE ADVANTAGE OF THE APPROVED NATIONAL RESEARCH AND DEVELOPMENT FUND (NRDF) "minimum of 1% GDP"?

(ii) FULLY FUNCTIONALISE THE APPROVED & INAUGURATED NRDI COUNCIL

(CHAIRED BY THE PRESIDENT!



NOTAP- ECN 2015

WITH ALL THESE, I HOPE..!

Solar Photovoltaic Markets Trends: American & Global Experience

Renewable Energy and Energy Efficiency Project

Robert Foster
Winrock International

USAID FROM THE AMERICAN PEOPLE

WINROCK INTERNATIONAL

Nigeria REEEP Goal

To facilitate the development and financing of renewable energy (RE) and energy efficiency (EE) markets in Nigeria that increase access to affordable clean energy, create jobs, and enable economic growth.

WINROCK INTERNATIONAL

REEEP Activities & Objectives

Component / Lead	Activities	Objectives
1 Access to Clean Energy Financing *Project Director*	1a. Assess and build on existing pipeline 1b. Assess opportunities in areas/sectors that support USAID/ Nigeria's portfolio 1c. Identify additional opportunities/targets for RE investment 1d. Identify financing options and train potential borrowers to access these opportunities 1e. Support and monitor implementation efforts	1. Develop capacity of DCA banks and other financial institutions 2. Strengthen capacity of companies to deploy and maintain clean energy projects, to provide a pipeline of potential projects for DCA and PFAN GDA 3. Strengthen capacity to access loans for agribusiness, health delivery sites, and businesses willing to retrofit with EE technologies. 4. Strengthen capacity of GON institutions to encourage enactment of appropriate RE and EE legislation. 5. Strengthen the capacity of vocational training institutes
2 Technical Assistance to Financial Institutions *Project Director*	2a. Secure bank management buy-in and select capacity building/training beneficiaries 2b. Deliver training and develop materials and guidelines for RE/EE lending 2c. Support marketing efforts to increase demand for RE/EE loans 2d. Build relationships and coordinate regularly	
3 Training and Awareness Creation *RE Policy & Engagement Spec.*	3a. Promote educational center training targeting RE and gender equality 3b. Foster awareness 3c. Job placement support	
4 Governance *RE Policy & Engagement Spec.*	4a. Support for a developed clean energy market 4b. Establish a Clean Energy Coalition 4c. Coordinate and collaborate to ensure buy-in and sustainability	

See Results Framework, Attachment C, for expected results and indicators

USAID FROM THE AMERICAN PEOPLE

WINROCK INTERNATIONAL

Classic Stand Alone PV System

WINROCK INTERNATIONAL

SOLAR LANTERNS

A few Watt solar lanterns provide basic portable electric LED lighting and cell phone charging using sealed LA or NiMH batteries.

Winrock AMORE Philippines (2002-2011)

HOUSEHOLD ELECTRIFICATION

- 474 rural villages energized
- Over 15,000 households with energy & lighting access
- More than 90,000 individual beneficiaries

SCHOOL ELECTRIFICATION & EDUCATION

- 277 rural schools with RE-powered electricity
- Over 73,000 student beneficiaries

WATER, SANITATION & HYGIENE

- More than 164 villages with safe water access
- 10,000 household beneficiaries
- More than 56,000 individual beneficiaries

WINROCK INTERNATIONAL

AFGHAN SOLAR CLINICS - Winrock

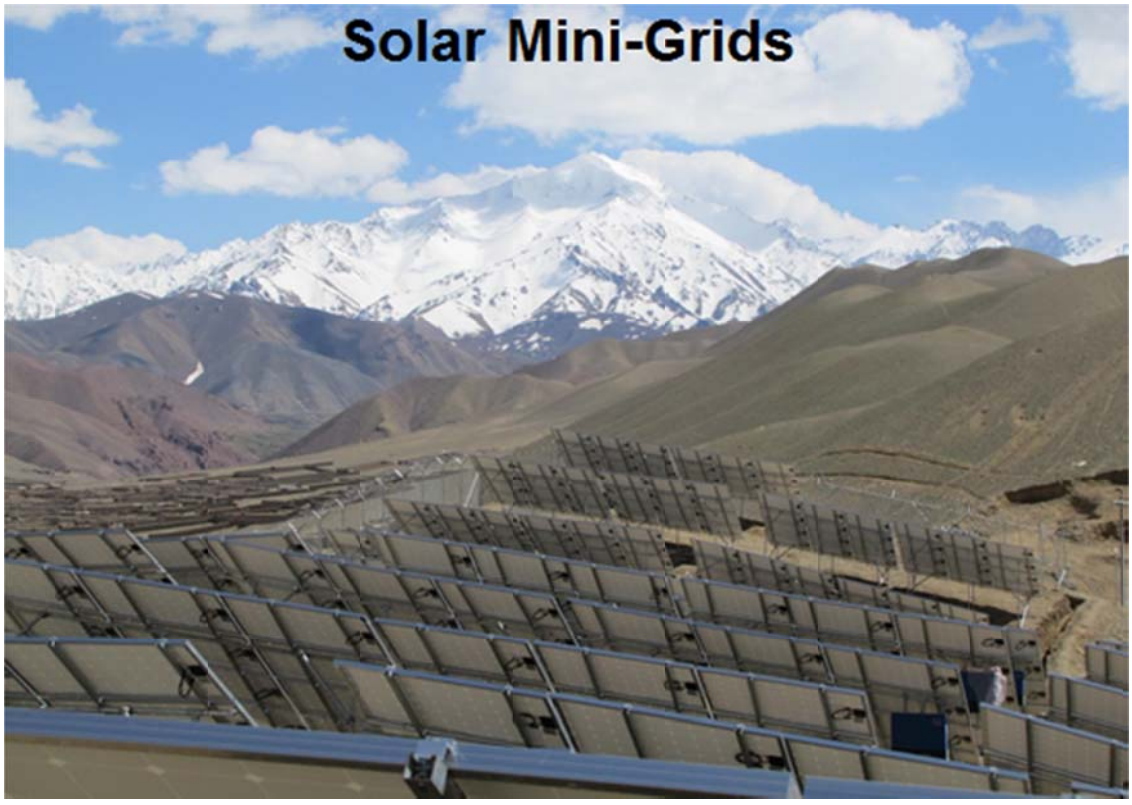
Afghanistan Solar Clinics 5 kWp each.

WINROCK INTERNATIONAL

3.3 kWp New Mexico Residential Off-Grid PV

Las Cruces

WINROCK INTERNATIONAL



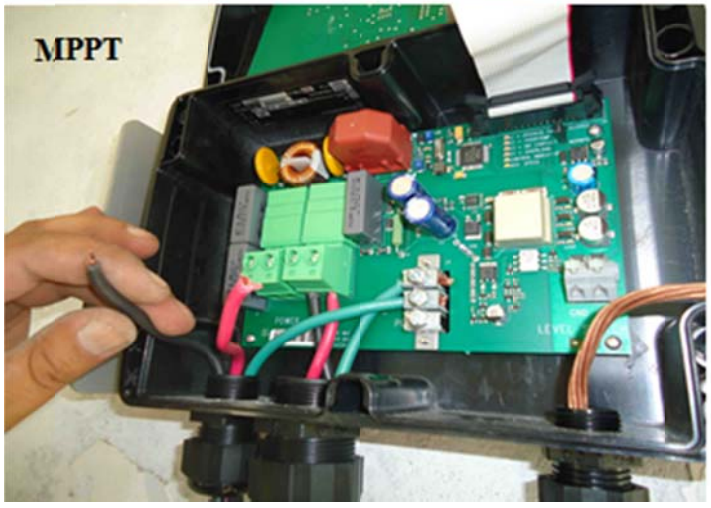
PV Streetlights with Li-Ion capacitors

Solar panel		20W monocrystalline silicon solar module.
	Dimension / Weight	343mmx580mmx35mm 3.0kgs
		Optimum operating voltage 14.4V Optimum operating current 1.57A
		Maximum power at STC 23Wp
LED light unit	Dimension / Weight	223x207x79mm 1.8Kgs 360°rotation + up and down (Level to 45°up)
	LED	Nichia power LEDx4
	Battery	Lithium ion capacitor Premlis A5000 x 2 16.6Wh
	Control circuit	Original circuit
	Waterproof performance	Subject to JIS C 0920 No3
	Material	Main housing/Aluminum Front cover/transparent polycarbonate

Solar Water Pumping
Future Pumps – Kenya

WINROCK INTERNATIONAL

Tech Advance: Helical Rotor Pumps



75 HP Solar Pump - Safford, Arizona

PV array powers three 25 HP ac pumps

SunPumps developing 100 kW controller

Estación Torres, Sonora 1994

480 Wp PVWP still working after 20 years!
Only maintenance was 1 pump replacement by rancher after 14 years

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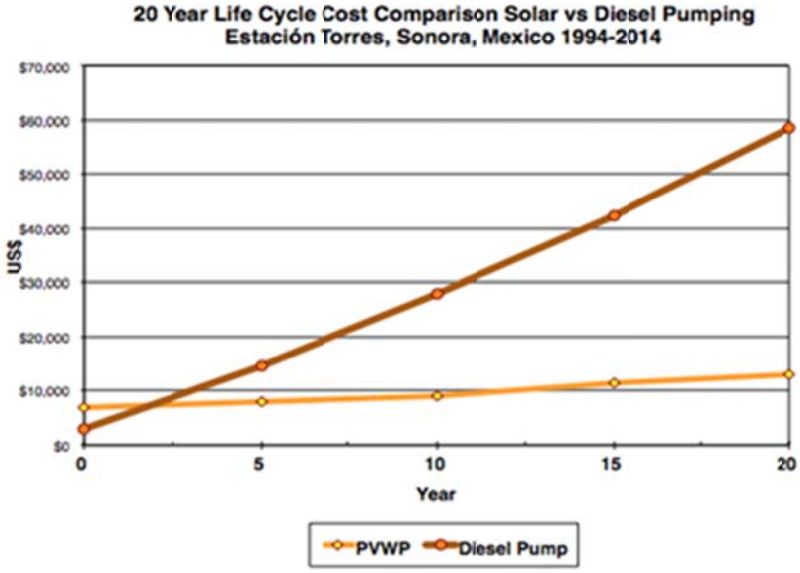
Life Cycle Cost Estación Torres



Over US$50,000 saved vs. diesel pump in 20 years

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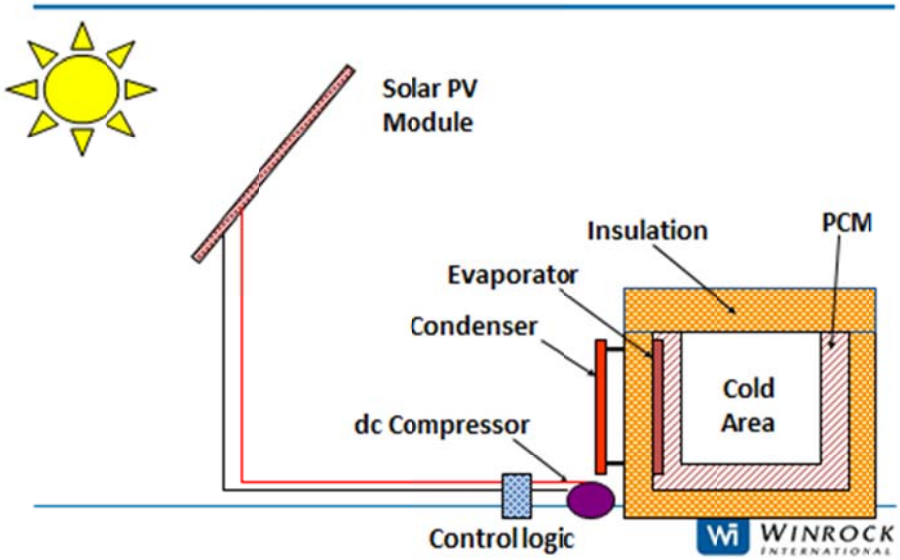
Photovoltaic Refrigerator (PVR)



Commercialized Vaccine PVR with PCM

PCM designed to freeze
at 4 °C
to protect vaccines
from freezing

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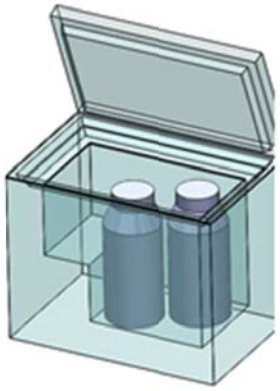
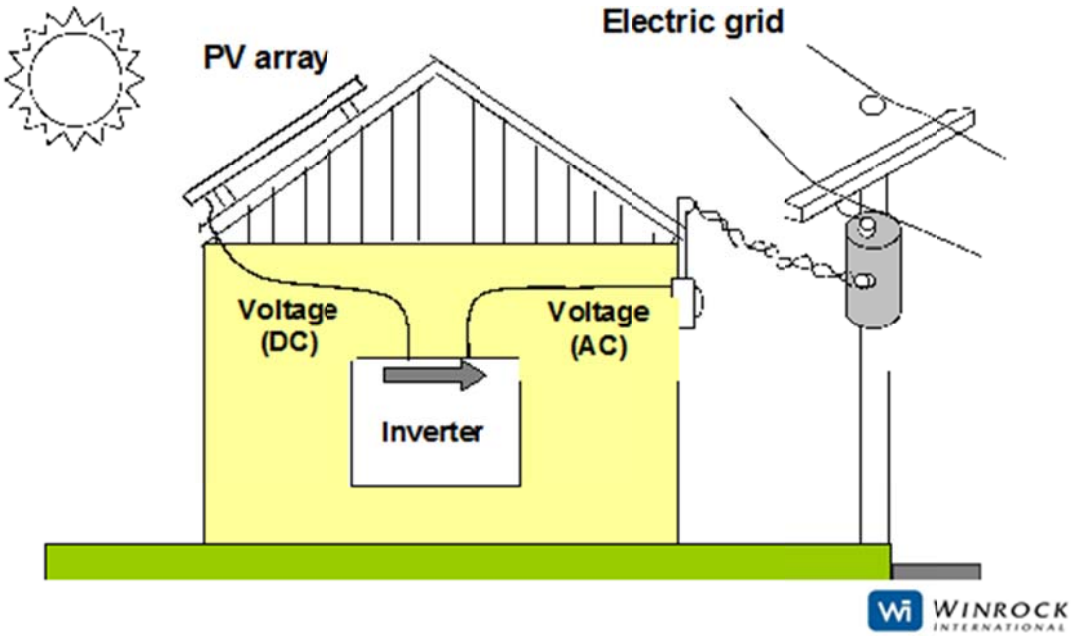
Innovative Fixed Tracking E-W Array Design Allows for Early Startup and Late Shutdown

Solution for On-Farm Cooling of Evening Milk



- Cools 24L of evening milk to 4 °C overnight
- Cools warm milk from cow below 10°C in 2.5 hours
- Uses locally available aluminum milk cans
- Chest refrigerator with internal phase change material ice packs
- Operate without batteries
- Food storage and 5V phone charging (2 USB ports)

GRID-TIED PV



US National Photovoltaic Program

NMSU SW Region Solar Experiment Station since 1981

Las Cruces Risser Household 3 kWp

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Ohta City Japan

Over 500 PV grid-tied homes in one neighborhood

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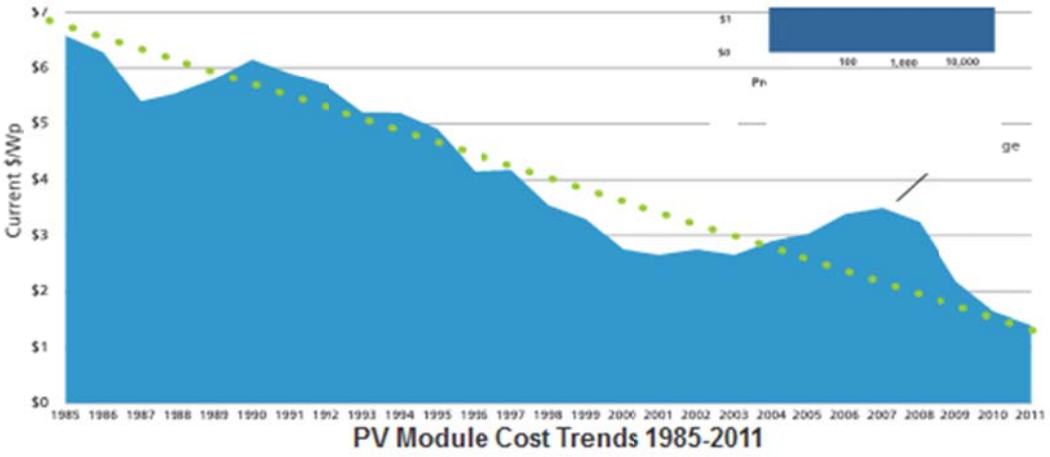
GRID TIED: Utility Scale Power

Large generation systems connected to the Grid

Large PV Generation Systems Grid

Cost Innovation: Cheaper PV

PV ~80% cheaper over the past 6 years
~US$0.50/Wp in 2015



PV Module Cost Trends 1985-2011

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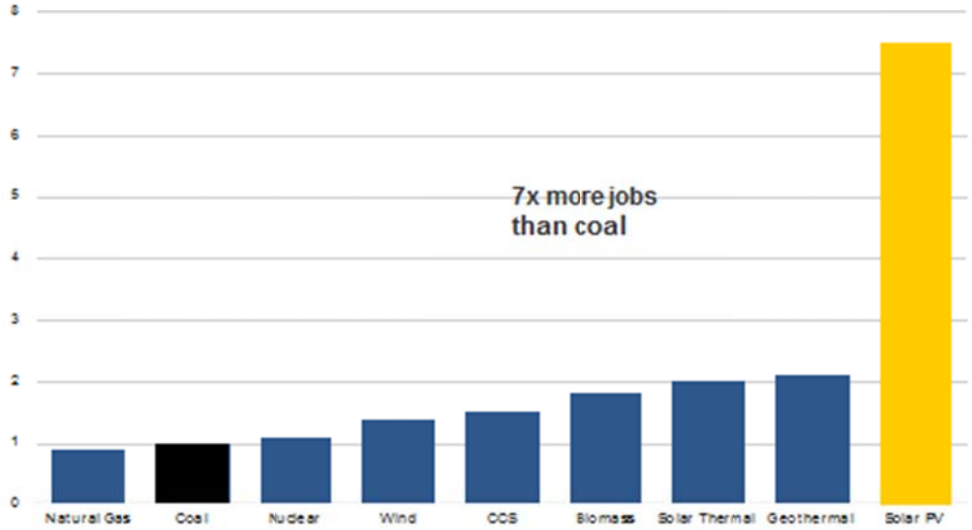
Sources: 1979-1983 data from IPCC, Final Plenary, Special ReportRenewable Energy Sources (SRREN), May 2011; 1985-2010 data from Paula Mints, Principal Ana

Solar Creates More Jobs

Average Total Jobs/MW



Sources: Kamman, David M et al, 2004, Report of the Renewable and Appropriate Energy Lab, Putting Renewables to Work:How Many Jobs Can the Clean Energy Industry Create?, Energy Resources Group,Goldman School of Public Policy, University of California, Berkeley;Wei, Max et al, 2010, Putting Renewables to Work: How Many Jobs Can the Clean Energy Industry Create?, Energy Resources Group,Goldman School of Public Policy and the Haas School of Business, University of California, Berkeley; In

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Photovoltaics Summary 2015

Module Efficiency: 10-22% (terrestrial)

~58 GWp of PV module production expected in 2015

Warranties: 20-25 years (lifetime > 40 years)

Module Cost: ~US $.50 per Watt

Applications:

- Grid Tie ~99% of Global Market
  - System Cost ~US $1.50 per Watt
- Off Grid ~1% of Global Market
  - System Cost ~US $5 - 8 per Watt

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PV Drivers, obstacles and opportunities

Price is key (even after subsidies)
Subsidies help (but not necessary)
Market segments differ
Managing/integrating intermittent power—the key role of "smart grids"
Storage is increasingly important
"Grid Defection" (e.g., Hawaii & Japan)
Overcoming utility/government resistance is a big challenge, especially in less developed countries

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Key Market Challenges

- Customers
  - Don't understand economics/financials
  - Don't trust vendors
- Utilities
  - PV/Microgrids seen as threat
  - Economic model is not clear
  - Change to status quo
- Government
  - Income based on fossil fuels
- Citizens
  - What is in it for me?

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Finance Challenges

- Finance
  - Fear, credit and size of market opportunity

Lenders unfamiliar with RE/EE Enterprises

- High collateral requirements (above 100%)
- High interest rates,
- Short loan tenors

- RE/EE enterprises have little credit history with banks
  - Lack of understanding of banking principles,
  - Short credit history, limited experience with lenders
  - New and inexperienced companies
  - RE/EE Sector considered risky

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Winrock's Role

- Upstream technical assistance to help create demand for RE/EE technologies
- Capacity building activities to ensure project bankability
- Portfolio development and management
- Transaction advisory services for lenders
- Technical assistance for universities and vocational institutes for RE/EE installation and maintenance
- Supporting improved governance and policy reform
- Coordination between banks, donors, GoN, private sector, communities, and other stakeholders

TECHNICAL SESSIONS: NASEF 2015

About 60 technical papers were presented at the forum spanning seven technical sessions.

1. Technical Session on Solar Thermal

Chairman of session: Prof. Adisa Ademola Bello, President of the Nigerian Institution of Mechanical Engineering.

Four papers were presented during the technical session. The first paper was presented by **Bilyaminu Alhassan** from Energy Commission of Nigeria.

Title of the paper: **Solar Thermal Technology in Nigeria.**

The paper highlighted the importance of energy in everyday life, which cannot be over emphasized. Energy is used in agriculture for food processing and preservation; and in the house hold for lighting, heating and refrigeration. Some of the thermal technologies discussed in the include :

(a). Solar dryer: which is been used for drying agricultural product that exclude the traditional method of open to sun or air drying.

(b). Solar cooker: which is used for cooking foods by concentrating them in a solar cooker in a temperature between 50-100c.

(c). Solar brooders: various sizes of the technology have been developed by NCERD Nsukka and is been used for chicken brooder.

These technologies eliminate the emission of product gases that are hazardous in health to both man and the chicken.

Recommendations: the paper made the following recommendations

1. Government at various levels should pay more attention to solar thermal technology by allocating more resources to it in their budget.
2. Private sector should be given the environment and encouragement by government to engage in the development of solar thermal technology.
3. Workable policy should be formulated for the renewable energy technology.

In conclusion, the paper pointed out that solar thermal technology in Nigerian economy is low at the moment despite the fact that many prototypes of the system have been well researched and developed within the Country.

Prof. Ifeanyi Okonkwo of UNN commented on the first presenter. He mentioned that it is important to see the level where we are, and what has been done on the research level of solar thermal technology.

The second paper was presented by **Engr Ismaeela Isa Rikoto**.

Title of the paper: **Performance Evaluation of A Mixed Mode Of Tomatoe, Solar Dryer And Modeling Of Drying Process.**

The third paper was presented by **Nsikem I. Obot** from the Dept of Physics, University of Lagos.

Title of the paper**: Utilization Of Solar Energy For The Purification Of Brackish Water At Lagos.**

The paper highlighted how solar energy system was used to purify water in four different basin linings.

(i) Conventional
(ii) Gravel
(iii) Charcoal
(iv) Dual

The paper also differentiates between gravel and charcoal in terms of heat absorption. But the combination of the two gives better distillation.

The fourth paper was presented by **Sadiq Umar** from Kebbi State University of Science and Technology

Title of the paper: **Construction And Performance Evaluation Of A Solar Dryer For Drying Medicinal Leaves.**

The paper highlighted the efficiency of the dryer to be 1.25%. The dryer was tested from 8am – 5pm in a day at the ambient temperature of 35.93^{o}C.

Dr Ozigi in his comment says that since we are comparing solar dryers here there is need for a graph and the presentation should reflect the title of the paper.