THE UNITED REPUBLIC OF TANZANIA

RURAL ENERGY AGENCY (REA)

Rural Energy Agency and Innovation in Delivery of Modern Energy Services to Rural Areas

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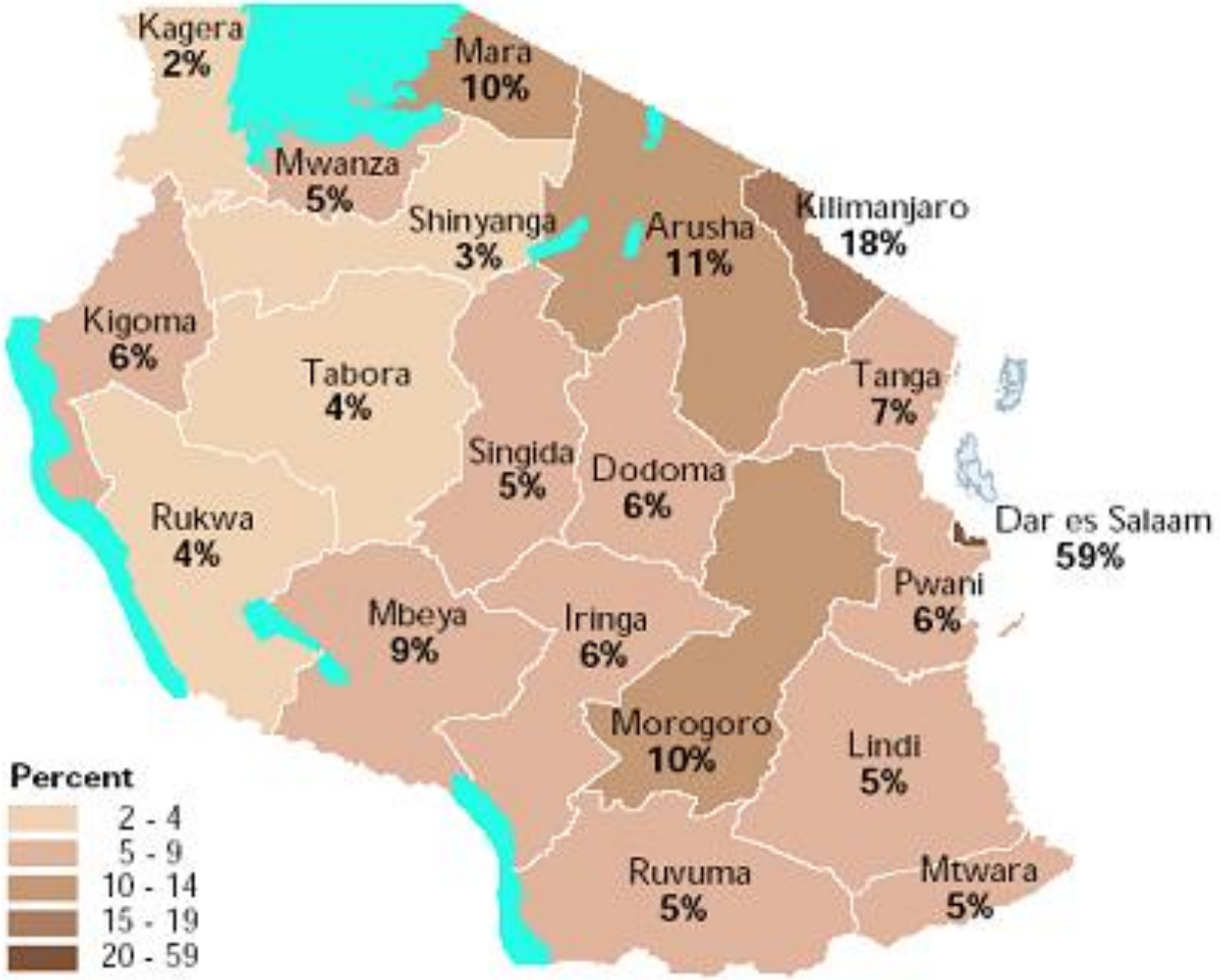
THE NATIONAL GRID SYSTEM

Electrification status around the country



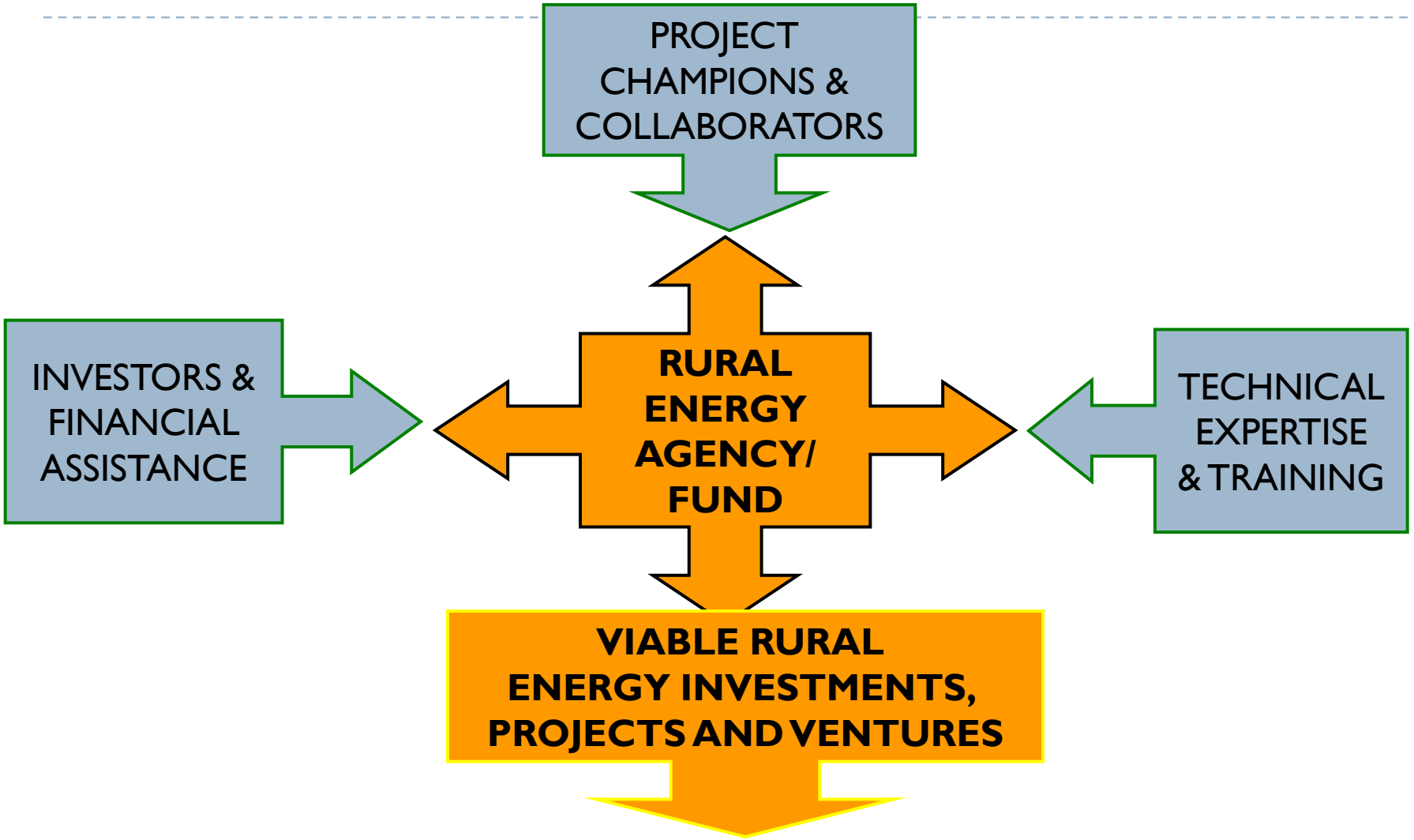
Energy Situation in Tanzania

- Less than 15% of the country has energy access. In rural areas, energy access is about 2%
- Limited installed capacity – 1,000 MW
- Recurrent power shortages
- Rural energy consumption makes up to 85% of the national energy consumption (biomass)
- Per capita electricity consumption: 100 KWh (versus 500 KWh required for quality life)
- Abundant, but largely untapped renewable energy resources, which could be harnessed for power generation and access expansion

About REA - the Rural Energy Agency

- REA is an autonomous body established under the Rural Energy Act of 2005
- The Ministry of Energy and Minerals (MEM) oversees the activities of REA
- REA's scope is to promote and facilitate improved access to modern energy services in rural areas
- REA is funded through government budgetary allocation, levy on electricity and Development Partners like the World Bank and Sida.
- REA often works as a facilitator to bring together project collaborators/champions, financing, and technical expertise to lead to innovation in service delivery.

Rural Energy Agency as Facilitator



Current REA Programs

- Support grid extension projects
  - Provide TANESCO funds for connecting new rural areas
  - Fund innovations in low cost distribution design etc.
- Implement the Tanzania Energy Development and Access Project (TEDAP) – Offgrid Component
  - USD 105Mn financing from the World Bank for strengthening the grid and promoting renewable energy projects
  - Sustainable Solar Market Development (Sustainable Solar market packages and commercial Solar PV)
  - Lighting Rural Tanzania with support from the Africa Renewable Energy Access (AFREA) Program
- Energy efficiency projects (improved biomass stoves and biogas for electricity generation and for cooking)
- Improve gender awareness and responsiveness throughout REA programming with support from the World Bank/AFREA

Tanzania Energy Development and Access Project

The objective is to improve the quality and efficiency of the electricity service provision and to establish a sustainable basis for energy access expansion and renewable energy development in Tanzania

On -grid component

Improving service quality and efficiency of TANESCO

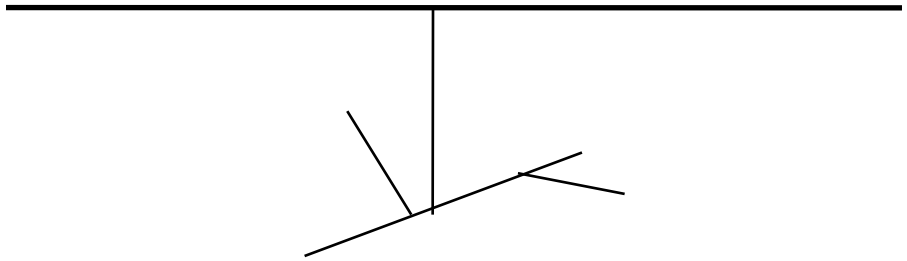
Off -grid component

Facilitating framework, grants and TA for new connections by third parties(private sector, communities, NGOs)
+ Additional financing to establish a credit line

- SPPs selling power to DNO's main grid (+ retail?)
- SPPs selling power to DNO's isolated mini-grids (+ retail?)
- SPPs – Greenfield mini-grids
- Solar PV institutional and household systems

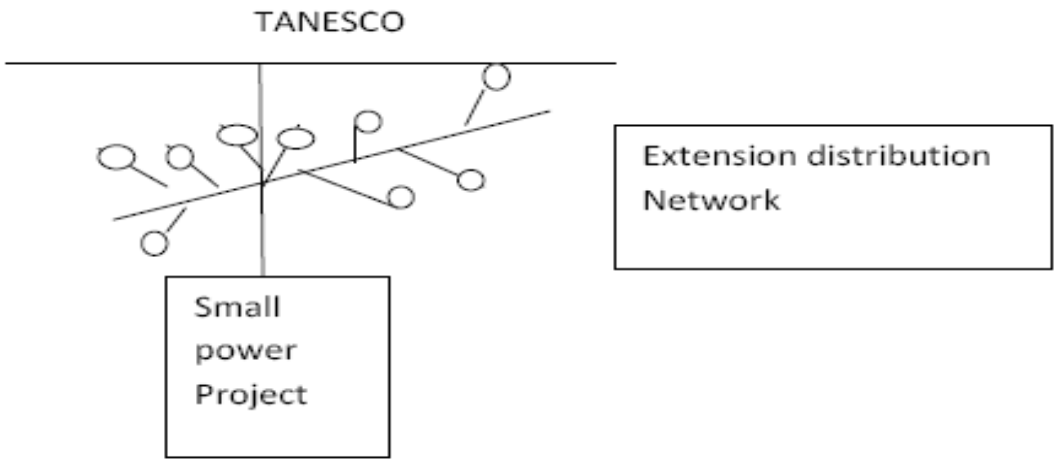
(SPP = small power projects)

Grid Connected Projects



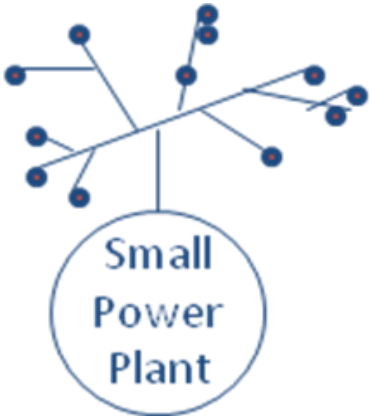
- Small Power renewable projects connected to the National Grid,
- Full private funded investment.
- Projects are facilitated through SSPA/T to be signed with DNO (TANESCO)
- Licensed by Regulator (EWURA)

Grid-connected mini-grids



- These are demand driven proposals by registered private operators.
- Finances only a portion of mini-grid investments
- SSPA/T applies for power sales to DNO only

Isolated (Greenfield) mini-grids



- Finance a portion of total system costs (including generation and distribution)
- Sole purpose to sell power to local communities and productive establishments

TEDAP Off-grid Component

About TEDAP Off-grid component	
Why?	❖Low electrification rate, limited supply, power shortages ❖Slow pace of electrification of the national utility (technical, financial and human resources constraints) ❖Mapped renewable energy potential - but remain theoretical ❖Supporting policy and institutional framework for rural electrification and renewable energy (REA recently established) Good **potential** to address both power generation and access deficits through **renewable energy SPPs** BUT regulatory, financing, capacity and institutional coordination challenges Project to focus on an **enabling environment**
What is TEDAP offgrid component?	A program launched by Ministry of Energy and Minerals (MEM) supported by the World Bank and Global Environmental fFcility (GEF) to help develop off-grid and renewable energy projects in Tanzania. The off-grid component has US $22.5 M allocated to improve rural electricity access, promote renewable energy projects and small scale solar market development

TEDAP Off-grid Component …… cntd

Benefits under TEDAP - Technical Assistance	
Matching Grants	Pre-investment support to developers for business and market development Technical assistance to local commercial banks for the appraisal of renewable energy projects
Benefits under TEDAP - Financing	
Performance Grants - Connection	Up to 500$ / connection in rural areas that currently do not have grid access; Covers maximum of 80% of the transmission and distribution costs of a project
Credit Line	A US$ 23 Mn credit line under TEDEAP which provides long term (15 years) funding to financial institutions that lend to eligible rural/ renewable energy projects on commercial terms
Loan Refinancing facility	The loan can cover up to 70% of the rural/renewable project loan (85% for projects <3MW) refinanced by the credit line; up to 15 year loan terms grace period of 5 years
Interest Rates	Banks can borrow at interest rates that are linked to the average term deposit rates; current rate is between 8-9% and this is revised every six months

Existing Enabling Regulations

- **Tanzania has enabling regulations in place to promote Private sector investment in renewable energy:-**
  - Policy to promote access in rural areas and increase use of renewable energy resources;
  - Both domestic and international investments in energy generation permitted;
  - Rural Energy Agency (REA) setup and functioning for over 3 years
  - Standardized Power Purchase Agreements (SPPA) exist for projects to feed <10MW to the grid, enforced by EWURA the independent regulator
  - SPPA purchase terms based on avoided costs, calculated by EWURA every year with floor and ceiling prices;
  - Private sector can enter into direct distribution in off-grid areas; $500USD per rural connection subsidy provided by REA through REF
  - Access to long-term financing through the credit line
  - Carbon credit PoA in preparation
  - Technical assistance provided to the developers, local commercial banks, sector institutions etc

Renewable Energy Projects portfolio in Tanzania

About 76 MW of projects with SPPA contracts or LoI signed with TANESCO (24 MW SPPA signed), many additional projects in development. Likely potential 100-200MW in the next 10 years. Main issue: high bank equity requirements.

Projects	Installed Capacity (MW)	Sale to TANESCO (MW)	TANESCO SPPA status
TPC sugar cogeneration (Moshi)	17.5	9	Signed
Tanwat (biomass) (Njombe)	2.5	1.4	Signed
Mwenga Hydro (Mufindi)	4	3	Signed
Ngombeni Power (Mafia) biomass	1.4	1	Signed
SAO Hill Energy (biomass) (Mufindi)	15.75	10	Signed
Kitonga Hydro (IKilolo)	10	7	In Discussions
Mapembasi Hydro (Njombe)	12	9	In Discussions
Ndola Hydro (Ruhuhu river)	10	9,5	In Discussions
Kilombero sugar co-generation (Kilombero)	3	2	In Discussions
Totals	76 MW	52.5 MW	

Value of Carbon Credits for projects

Parameter	Units	Project Type	
Capacity	MW	**1 MW, main grid**	**1 MW minigrid**
Plant Factor	%	60%	60%
Emissions Factor	Mt Co2 / MWh	0.55	0.80
Carbon Revenue	c/ kwh	0.66	0.96
% of TANESCO tariff	%	9%	4%
Annual Carbon Revenue	USD / Year	34,690	50,468

- Carbon revenue can add about 10% of additional revenue for main grid projects boosting project returns and debt repayment ability
- Diversified source of income separate from Tanesco SPPA

Challenges with Carbon Credits

- Long validation process that can take years
- High application costs make it not viable for smaller projects (<3MW)
- Kyoto protocol supporting carbon credits expire in 2012 with no global agreement to extend this
- Getting advance on carbon credits can help fill equity gaps, but getting such arrangements is difficult

Solar Energy Development

- For schools, dispensaries, offices, etc.;
- From 300Wp to over 1kWp;
- For lighting, computers, fans, refrigerators (for vaccines), etc;
- Most of existing systems are donor funded without plans for maintenance and replacement of batteries;
- LGA to be responsible;
- Great potential to upscale numbers of institutional systems with REF funding;

PV systems installed to Health Facility

Schools

- More than 17,000 non-electrified schools;
- In modern times, secondary schools cannot provide adequate education without computers and internet access;
- Lighting in boarding schools allows kids to study at night.
- Studies have shown that children in schools with solar lighting perform better in exams when compared to students in schools without electricity;

Some of PV Applications for Productive Uses

Mobile phone charging

Radio cassette vending

Lighting Rural Tanzania Competition

Problem

- 90% of Tanzanian's without electricity and opportunities and quality of life it provides;
- Approximately 98% in rural areas (39 million people)
- Even with aggressive targets and efforts, not everyone will obtain energy access in the short term.

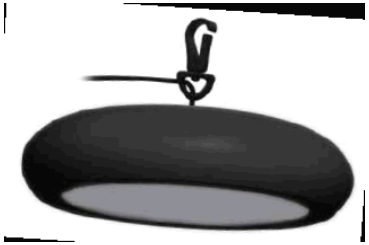
Off-grid lighting as a compliment to ongoing efforts

Lighting Rural Tanzania Competition .. cntd

- Support **innovative business models** increasing access to sustainable, **affordable clean off-grid lighting** products and services in **rural** Tanzania
- Objectives
  - ***Fund projects with potential for replication and scale up;***
  - Link **global investors with local suppliers** and service providers and share business and financing approaches;
  - Set the ground for **eliminating wick and kerosene lamps** with high CO_2 emissions and a direct impact on our environment; and
  - **Improve health of women and girls** prone to smoke and respiratory illness from using inferior energy sources
- Implementing10 projects over 12 months
  - Up to 100,000 USD in seed funding
- Implementing in 11 regions of the country

Tanzanian market

Lighting products in Tanzania (quality and low quality)



Characteristics

- Average expenditure per year on off-grid lighting is 61.2 USD[1]
  - Average monthly hh income- 90 USD
- New LED technology has brought down prices and improved the quality of solar lanterns
- Average prices range from US$13 to 67
- Quality products available, but low quality also available
- Quality LED-based market in Tanzania dominated by one firm;

1. Dominant technology- paraffin lamps with wick. Source: Lighting Africa Market Research, 2008

Rural Energy Access – Challenges Ahead

- Support research and development of renewable energy
- Promote entrepreneurship and private initiatives in the production and marketing of products and services for rural and renewable energy.
- Ensure continued electrification of rural economic centers and make electricity accessible and affordable to low income customers
- Establish norms, codes of practice, standards and guidelines for low cost rural electrification

Gender Aspects in Rural Energy

- Men and women often have very different energy needs and energy access. For instance, women are often executing some of the most time intensive tasks - tasks which are made much more efficient with energy services.

- Examples of how energy access can have different impacts for men and women:
  - **Household use:**
    - Access to affordable, modern fuels is essential for cooking, heating and food-processing that does not rely on biomass (smoke emissions, gathering time) – essentially for helping women move up the energy ladder
    - Women's economic empowerment through small enterprise often takes place in the home (beer-brewing, food processing, pottery) – therefore are part of household energy use.
  - **Lighting:**
    - Improved lighting can increase women's literacy, education, income-earning options, security in public spaces
    - Water Pumping:
    - Water gathering is often women's responsibility – burdens time, strength, limits agricultural productivity, decreases sanitation, reduces food preparation abilities
    - Transportation:
    - Without transportation services, it can take more time and energy to refill fuel and water; other activities requiring travel have higher opportunity costs
    - Information and Communication:
    - Where women operate largely in the domestic sphere, radio and television can be key for keeping them informed about community decisions, activities, programs, etc

Operationalizing the Gender Sensitive Approach

- Benefits of a gender responsive approach:
  - Improving access to energy services can greatly improve health and welfare;
  - Provision of reliable and affordable energy services for household cooking will contribute to gender equality and women empowerment
- How to meaningfully integrate gender into Rural Energy Access?
  - There is a need to mainstream gender during planning and implementation of their project.
  - Accessibility and affordability are key to make innovation have impact
  - Must be coupled with other efficiency technologies, so as to not just extend the workday without improving efficiency

REA Gender and Energy Initiative

- A tentative action plan has been designed to promote gender mainstreaming in REA activities
  - A gender assessment will be conducted to identify opportunities for gender mainstreaming within REA itself, and in projects
  - Based on the assessment, a capacity building plan will be designed, including:
    - Capacity building activities for all staff,, including technicians, and with a focus on M&E
    - Capacity building activities for project developers, so that they are aware of gender dimensions of energy
  - Development of tools and M&E framework for Gender in REA

ASANTE SANA!

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