

# DEPARTMENT OF ENERGY



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# DEVELOPMENT OF THE SOUTH AFRICAN NATIONAL SOLAR WATER HEATING STRATEGY & IMPLEMENTATION PLAN

A facet of the World Bank/GEF funded “Renewable Energy  
Market Transformation (REMT)” project

## Overall Recommended High Level Strategic Framework

Presented by Yaw Afrane-Okese



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# Recommended Strategic Framework

In response to the Ministers target of 1 million and the question, “how can the take up of Solar Water Heating be rapidly increased across the >11 million South African homes”, this presentation covers:

- The overarching programme key development principles
- An analysis of the low temperature water (< 70°C) heating market in SA
- Market segmentation as a basis for a “set” of deliverable solutions
- Solutions acceptable to the market that can be implemented on a rapid roll out basis – “the logic of the solutions is the not the logic of the problem”
- Answers to the question, how can these market offers be implemented, the business case for each and institutional arrangements?
- Concludes with a programme vision, delivery targets by market and the compelling benefits to South Africa.

This work has been completed by the joint initiative of the Department of Energy and the World Bank through the Renewable Energy Market Transformation (REMT) Unit



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**Current initiatives and industry levels will take over 15 years to reach 1 million or 75 years to reach 50% market penetration, excluding 2.5% growth**

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# Core South African SWH Goals



1. Reducing electricity demand – to ensure better utilisation of current electrical generation plant
2. Providing universal access to modern, affordable and environmentally beneficial SWH services for all households in South Africa on an equitable basis
3. Offset rising electricity cost to residential households through savings on water heating by coal generated electricity
4. Accelerated water heating service delivery, particularly to low income and indigent households utilising renewables
5. Achieving renewable energy targets of 10,000 GWh contained in the ‘White Paper on Renewable Energy’ of 2003
6. Contribute to South African Mitigation Strategy (LTMS) for climate change
7. Creating competitive and sustainable local SWH equipment manufacturing and installation/maintenance base in South Africa
8. Creating sustainable new livelihoods
9. Correction of the energy mix, moving water heating from electricity to a renewable energy



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# Key Strategic Design Principles

Key strategic principles have been identified as a basis for an effective strategy to achieve accelerated delivery:

1. A market focused and needs driven strategy to ensure **maximum take-up** and deployment of solar water heating in the country.
2. Segmentation of the total residential market into discrete sectors and '**needs clusters**', plus a commercial/industrial market
3. A '**fit for purpose**' limited range of proven technology, systems & supply arrangements to meet the precise needs of each market sector
4. Business model/s and funding methods to ensure **universal access** to all homes in South Africa on sliding scale basis with upper income householders contributing significantly to the cost through to indigent homes receiving a "virtual free" SWH System. This is a '**public access**' to essential service and **market creation** programme since lower income households (>75% of total SA households) are currently un-served.
5. Enabling the programme through **institutional delivery models** to ensure economies of scale, clear leadership & accountability for results,



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# Strategic Principles Continued

Key strategic principles cont:

6. Institutional delivery models that **integrate and leverage** a range of financial, organisational, public and private sector activities to create a co-ordinated and focused delivery operation. Deployment of a range of income streams, training and new business incentives, skills training centres, SABS, tax incentives, private sector supply and installation etc.
7. Re-engineered supply chain, **driving costs down and efficiencies up** at every stage. A new, stand alone and competitively resourced national SWH programme operating on a market sector targeted 'roll out' basis' similar to electrification, to remove delivery constraints.
8. Deploying large volume buying of specified SWH Systems at **discount and stringent competitive tendering** and contractual arrangements with private sector installation sub contractors
9. Capacity building & livelihood/job creation with **dedicated skills training** and accreditation
10. Sustainable South African **low cost, high volume**, SWH system manufacturing and installation industry within a defined time period after the commencement of the national programme



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**Logic of the solution design versus a logic  
of the barrier/problem solving approach**

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# Programme segmentation

## Existing residential users of hot water - 3 x retrofit markets

- 1. Upper income ~ 1.2 million existing geyser
  - Customised installations – dissimilar roof designs
  - Water mains supplied
- 2. Middle/low income ~ 3 million existing geysers
  - Similar construction – built by developers mass roll out suitable/kits
  - Water Mains supplied
  - All formal dwellings, load bearing roofs
- 3. Non geyser ~ 6 million household
  - Lower hot water needs
  - Broad range of house types – built by developers mass roll out suitable/kits
  - Formal, RDP, site service, squatter
  - Limited mains water supply

## Two new purchase related markets

- 4. Failure related geyser replacement (insurance linked) 0.3 m/year
- 5. New build houses 0.25m/year

## Industrial uses and commercial buildings/processes

- 6. Public and private users



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**Total of six homogenous market groupings  
requiring different solutions**

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# #1 Residential – Upper Income Retrofit

## Product types

- Complex systems, custom installation
- High levels of service delivery demanded

## Delivery arrangements

- Existing SWH supply industry well positioned to supply – 1.2 million market, big scope
- Standard offer of a subsidy/rebate on any qualified SWH system (SANS approved etc.), to be suitably administered.
- Subsidy limited to a maximum of two geysers per home to a maximum of a cost of one standard solar water system issued under the middle to low income household.
- New energy efficiency regulations to be instituted requiring home owner to achieve a certain level of energy efficiency before the owner can sell a property. This can be managed via the Energy Efficiency standard SANS204, the building regulations and the Deeds Office for management *during transfer*.
- Improved market and promotion of the opportunity in the short term

## Conversion costs (income >R16,000/month)

- Currently price levels for a 200 litre system R13,000 – R30,000
- Normal commercial rules apply – home owner decision on size, type etc.
- Electricity price increases will start to make the switch more attractive

## Institutional implementation arrangements

- Existing private sector initiatives and
- Energy Efficiency regulatory regime restricting electric water heating loads, manage the programme rules, tariff setting and subsidy levels



# #2 Residential – Mid/Low Income Retrofit

## Product type

- Straight 150 lt geysers replacements
- Collector = 2m<sup>2</sup> copper
- Storage tank = 200 litres
- Choice of split or closed coupled



## Delivery arrangements

- Delivery arrangements
  - International tender based purchase of a standard system (everything in the box for a complete installation). Manufacture phased from import to local
  - Centralised logistics (stores and delivery to site)
  - Contracted marketing and installation services through an Energy Supply Companies (ESCO) in an area
- Modus operandi – Geographic area by area roll out
  - Once off marketing offer, to achieve an acceptable penetration before start
  - Installation teams work street by street
  - Area support offices with local maintenance agents for after sales service

## Business model/funding

- System cost installed – Closed couple R6500, Split R8500
- Subsidy components, Standard offer R/KWh Displaced, CDM R3,065 & other

## Conversion fee after subsidies plus Vat (income >R16,000/month)

- Split unit < R2,500 – financing if interested – higher value/aspirational item
- Close-coupled unit < R0 (No cost to the consumer to increase uptake). Possibly the need for an initial connection fee to manage demand

## Institutional implementation arrangements

- A dedicated SWH entity with a national mandate/licence to procure p contract sales and installation organisations to delivery to the middle geographical household areas across South Africa.



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# #3 Residential – Non Geyser Delivery

## Market overview

- Formal Plot , Formal Dwelling
  - 3.4 million
- RDP Houses
  - 1.22 million
- Hostel & multistorey
  - 0.21 million
- Formal Plot, (Site and Service)
  - 0.5 million
- Informal Plot + Shack (including Backyard Dwellers)
  - 0.44 million
- Traditional Dwelling
  - 1.0 million



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# #3 Residential – Non Geyser Delivery

## Mounting and Filling Permutations of SWH System Offerings

- Mounting Method (Large Roof, Small Roof or Ground / Stand Mounted)
- Filling Method (Mains Supply or Manually Filled)
- Given that Manual Filling and Roof Mounted are mutually exclusive, the System Mounting and Filling Permutations are reduced to:
- Option A. Roof mounted, Mains Supplied, Gravity Fed SWH
- Option B. Ground or Stand Mounted, Manually Filled, Gravity Fed SWH
- Option C. Small Roof Mounted, Mains Supplied, Gravity Fed SWH
- Options D. Small Stand Mounted Biomass fired mains or gravity fed

## Water requirements

- Formal and RDP homes 100lt/day
- Shack and self build 50lt/day



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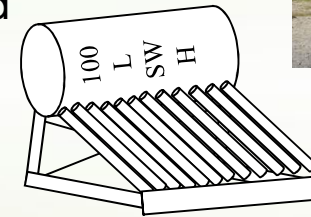
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# #3 Residential – Non Geyser Delivery

## Design solutions

### A: 100 litre roof mounted

- Low Pressure Solar Water Heater
- Roof Mountable on Inclined Stand
- Mains Pressure Filled Similar
- Tempered Output
- Cost ~ R3200 + installation



### B: 55 litre roof mounted

- Low Pressure Solar Water Heater
- Roof Mountable on Inclined Stand
- Mains Pressure Filled Similar
- Tempered Output
- Cost ~ R1000 + Installation



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# #3 Residential – Non Geysers

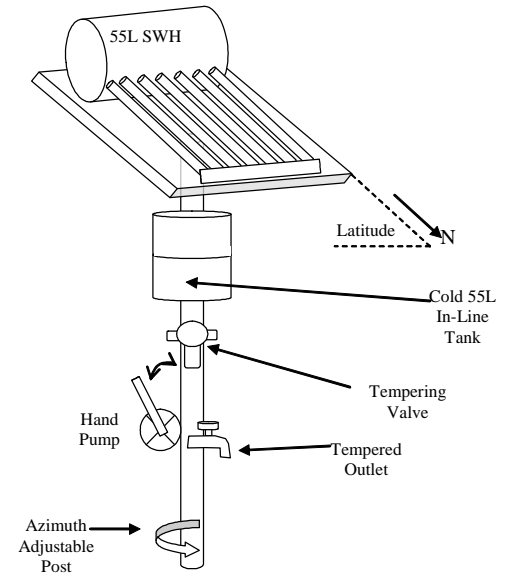
## Design solutions

### C: 55litre Pole mounted

- Low Pressure Solar Water Heater
- Free Standing Inclined at Latitude
- Raised Above Building Level
- Manually Fill able (requiring Pump)
- Tempered Output
- Cost ~ R1,500 plus inst labour

### D. Bio Fuel based water heaters

- Uses any fuel – crop waste, dun, paper
- Fairly quick heating 50 lt < 30 min
- Provides on demand
- Cost ??



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# #3 Residential – Non Geyser Delivery

## Delivery arrangements

- Delivery arrangements
  - International tender based purchase of a standard system (everything in the box for a complete installation). Manufacture phased from import to local
  - Centralised logistics (stores and delivery to site)
  - Contracted marketing and installation services in an area
- Modus operandi – Geographic area by area roll out
  - Once off marketing offer, to achieve an acceptable penetration before start
  - Installation teams work street by street
  - Area support offices with local maintenance agents for after sales service

## Business model/funding

- System cost installed – 100 lt ~ R3500, 55 lt roof or pole mounted <R2000
- Subsidy components 100 lt; Standard offer R/KWh Displaced, CDM R1400
- Subsidy components 55 lt; Standard offer R/KWh Displaced, CDM R800

## Conversion fee after subsidies plus Vat

- Given the market and need for take up R0

## Institutional implementation arrangements

- A dedicated SWH entity with a national mandate/licence to procure product, contract sales and installation organisations to delivery to the non geyser user geographical household areas across South Africa.



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# #4 New build

## The new build will have to cover two sectors:

### – Upper/middle income homes

- Covered via bylaws and regulation requiring all new homes and commercial/Industrial properties to install a solar geyser to be able to access electricity and water connection
- Managed under the Energy Efficiency rating process of a home, and can be enforced via the normal building inspector role in the municipalities
- Existing SWH industry available to supply to this market

### – RDP/Affordable homes

- RDP market must also be covered by regulation, but needs financial assistance from the government.
- To limit increase in RDP house costs, require developers to draw stock from the Retrofit programme and only be responsible for installation. Thereby inclusion of standard offer and CDM subsidies

## Institutional/delivery recommendations

- NERSA/legislation based rules aimed at restricting the elec., water heating loads and to manage the programme and setting subsidy levels.



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# #5 Geyser Replacements

## Basic approach

- Replacement market requires some orchestration (legislation is difficult given the net difference between a straight electrical geyser and the SWH replacement cost)
- Note, not all households with a geyser have insurance
- Joint Insurance/supplier/standard rebate deals to be put in place for offer to customers – based on Standard Offer
- Significant promotion of this is required to ensure it becomes the norm.
- All future electric geysers to be SHW compliant by law once existing stocks depleted.

## Institutional/delivery recommendations

- NERSA/legislation based rules aimed at restricting the electrical water heating loads and to manage the programme and setting subsidy levels.



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# #6 Industrial & Commercial

## Market overview

- Public sector
  - School, colleges, university and other institutions with hostels
  - Welfare and medical institutions
  - Military barracks & Correctional Services facilities
  - National & regional parks boards
  - State owned ministerial houses & other public sector buildings
- Private sector
  - As above property categories

## Basic approach

- In the industrial and commercial sector each system is custom designed
- It is recommended that the standard offer or tax rebate offering be used in this sector. Both use the same basis of operation, except the funds are sourced from different streams.
- The standard offer/ tax rebate will work as follows:
  - Pre-measurement performed and Baseline published.
  - SWH, Heat Pump or combined System installed.
  - Measurement and verification equipment installed, and MWh saved quantified.
  - Funds paid to consumer from Utility in form of R/MWh (Will be published year on year), or claimed against tax at close of financial year in form of tax rebate, also R/MWh based.

## Institutional/delivery recommendations

- NERSA/legislation based rules aimed at restricting the electrical water heating loads and to manage the programme and setting subsidy levels. Private sector competitive supply.



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# Supporting Activities

## Key Policy Interventions

- Integrated national SHW policy framework from Government
- Target setting by cabinet – delivery non negotiable
- Mandating of the utility
- Role clarity between stakeholders/Ministries/providers

## Regulatory and legal matters

- Set up of the Entity under the PFMA
- SHW market rules via NERSA
- National building codes/regulations
- LA building inspectorates for SHW approvals and bylaws
- New build, modernisation and geyser replacement legislation

## Creation of sustainable SHW market

- Local manufacturing: DTI inward investment
- All utility procurement inclusive of increasing local manufacture clause
- Fiscal investment incentives

## Skills development, training and capacity building

- Dept of Labour: skills training facilitation and accreditation
- Large installation contractors required to undertake training responsibility
- Step up of service/support entrepreneurs
- Current SWH industry to support upper income training



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# PROPOSED SERVICE DELIVERY MODEL

- Energy Services Companies (ESCO) model is proposed as a service delivery vehicle. The ESCO be a registered and accredited private sector institution tasked to provide SWH within a national policy and funding framework in their designated areas of jurisdiction. It will be tasked with the responsibility of maintaining the installed system in its area of operation (Concession).
- Critical key enablers that the delivery entity must provide:
  - Affordability :low cost best quality systems through bulk buying. Large scale contracts with quality assurance.
  - Obtaining and management of funding: carbon offset, DSM and other revenue streams
  - Rigorous supply chain management
  - Large scale project management and disciplined deployment of wide range of sub contractors
  - Protection of customer rights and interests – flooding/repairs
  - Accountability to NERSA, Government, funding bodies & nation
  - Large scale, professionally orchestrated rapid delivery



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# An aspirational national vision



- Rapid take up and conversion to Solar Water Heating for low temperature (washing) water applications is of national importance (saving generating capacity, lowering residential customer energy costs, reducing environmental impacts )
- As such the following visionary statement is recommended to drive the required changes to the energy economy:

“By the year 2020, aim for 50% of residential water heating needs to be supplied by solar water heaters, plus the widespread use of solar water heating and other heating technologies in the commercial and industrial sectors.”
- Such a vision will need to be aligned with Integrated Resource Planning process
- But clear short and long term targets are needed to drive for vision achievement



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# Composite market based targets

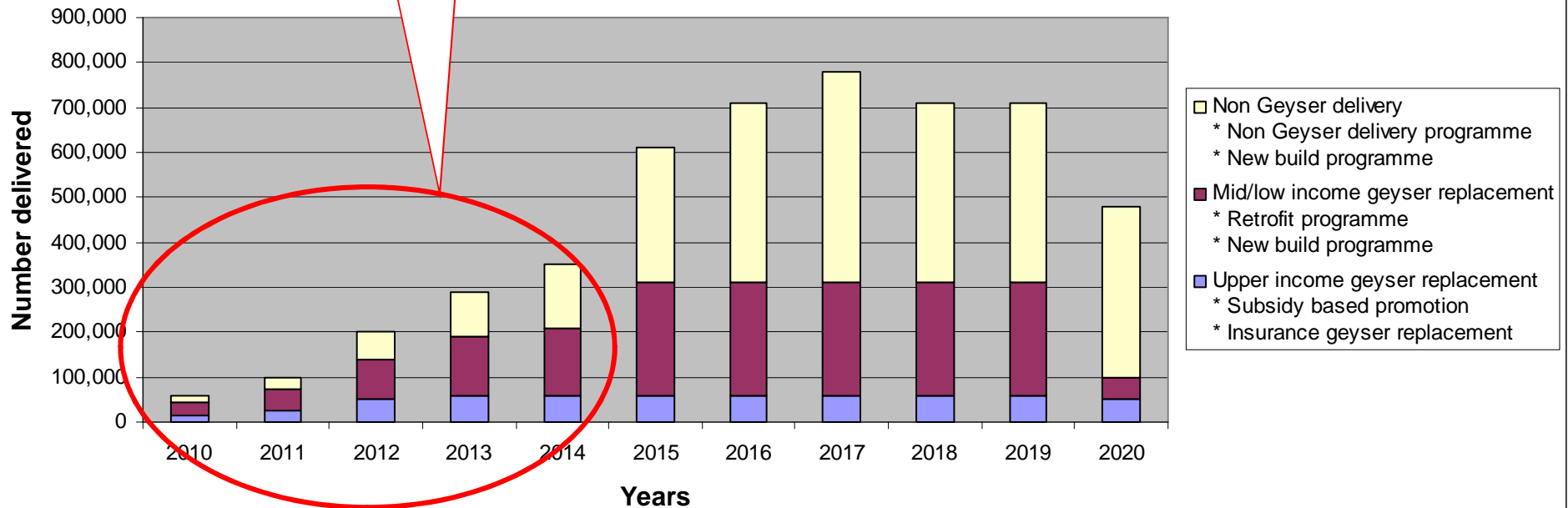
## Proposed market and programme based targets



Minister's proposed  
1 million delivery  
to un-served  
households

Residential market targets	By 2014	By 2020	Potential	%
Upper income geyser replacement * Subsidy based promotion * Insurance geyser replacement	210,000	560,000	1,200,000	47%
Mid/low income geyser replacement * Retrofit programme * New build programme	450,000	1,750,000	3,000,000	58%
Non Geyser delivery * Non Geyser delivery programme * New build programme	340,000	2,690,000	6,600,000	41%
	<b>1,000,000</b>	<b>5,000,000</b>	<b>10,800,000</b>	<b>46%</b>

Composite Target Graph



# Business model principles

## Basic approach

- Self funding programmes – Endeavour to get costs = subsidy plus customer contribution
- Stepped prices – highest for upper, lowest for indigent
- Minimal treasury support expected
- Large scale roll out to significantly reduce costs
- New institutionalise to deliver to the middle/low income market

## Primary sources of funding

- Standard offer – based on electricity Gx, Tx, Dx savings
- Programmatic CDM funding – centrally coordinated to give the size
- Other small funding components
  - Indigent support
  - DTI for local manufacture

## Utility funding model - self sustaining entity

- Individual programmes – costs = income
- Cash flow funding required – gap between timing of expenditure and subsidy income



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**Final agreements on business case and  
funding streams in process**

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# SWH Goals Impact after 1 million

- Basic goal achievements

Residential market targets	Reducing electricity demand MW	Universal access	Offset rising electricity cost	Accelerated service delivery	Renewable energy targets GWh/annum	Climate change '000 tons
Upper income geysers: * Subsidy based promotion * Insurance geyser replacement	130	Completely equitable across the markets. Plus frees grid capacity	<60% of water heating costs		252	612
Mid/low income geyser: * Retrofit programme * New build	279		<70% of water heating costs	Major impact	540	1248
Non Geyser delivery: * Non Geyser delivery programme * New build programme	211		<80% of water heating costs	Major impact	408	842
	<b>620</b>				<b>1,200</b>	<b>2,703</b>



- CDM by 2013 = 1,491,000 tons over the 5 years
- Cost benefit analysis (CBA) still being completed
- Other benefits
  - Local manufacturing capacity development – leading to export
  - Job creation – temporary and permanent
  - SHW service, skills and livelihood legacies in poor communities



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# Strategy Development Process

6 Nov 09	SWH Strategic framework presented
6 Nov 09	Presentation emailed to all delegates
20 Nov 09	Deadline for submission of written inputs/comments to be provided by return email
4 Dec 09	Final SWH Strategic Framework presented to the Minister of Energy

**Commencement of detailed implementation planning in readiness for launch on 1st April 2010**



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# Programme Implementation Process

## **Nov – Dec 2009 – Strategy and Framework Planning**

- High level Strategic Framework completion
- Consultations
- Inter Ministerial meetings
- Funding principles ratified, including NERSA and CDM

## **End January 2010 – Implementation planning**

- Detailed implementation plan completed
- Standard offer/M&V protocols
- Business cases finalised

## **February 2010**

- Minister issues a section 34 determination (Integrated Resource Plan) & set EEDSM targets 1 Million SWH over MYPD +2

## **End March 2010**

- Repository/national ESCO/Body clarified



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# Programme Implementation Process

## April 2010 – National SWH Strategy & Implementation launch

- Manufacturing tendering
- ESCO tendering under independent system operator – covering implementation, marketing, sourcing, installations, maintenance, financing, etc.

## 2010

- Installation of first units in targeted areas

## 2011-13

- Continued installation of units, moving to greater local manufacture

## 2014

- Achievement of Minister's 1 million system target

## 2020

- Further 4 million units targeted for completion



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Thank you



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