

PROMOTING SOLAR WATER HEATERS FOR URBAN HOMES AND BUSINESSES

ROSARIO, ARGENTINA



Photograph: Shutterstock

An ordinance from 2012 calls for solar-heated water in public buildings

Ordinances and regulations are an increasingly common policy tool for local and regional governments to address urban environmental challenges and promote widespread renewable energy uptake. A key example is the increased use of solar thermal ordinances during the past decade, with notable examples emerging from Barcelona (ICLEI, 2014), Beirut, New York City and Sao Paulo. This case study examines the experience of the Argentinian city of Rosario.

Rosario's public buildings must obtain half of their hot water via solar installations

The Rosario ordinance requires that all new or upgraded public buildings – including sports facilities and community centres – heat at least 50% of the hot water they consume through solar water heaters (SWHs). The policy is part of Rosario’s Sustainable Building and Energy Efficiency Programme, which broadly aims to increase the use of renewable energy across the municipal building stock.

The ordinance is expected to result in significant reductions of both greenhouse gas (GHG) emissions and energy consumption, thereby helping to fulfil the city’s broader sustainability objectives. Notably, the legislation reflects the successful involvement of multiple levels of government, academia, civil society, the private sector and the community at large.

The challenge of promoting renewables through municipal ordinances

SWHs typically consist of a solar thermal collector and a storage tank that provides hot water and caters for related heating needs. In countries with sufficient irradiance, SWHs are capable of providing anywhere from 50% to 90% of annual domestic hot water needs (IPCC, 2007). SWHs are primarily used in single-family homes and apartment buildings, with the strongest markets being in China and Europe; however, there is significant potential to expand into commercial and industrial markets (IRENA, 2015). As of 2016, the total installed capacity of solar thermal systems worldwide was 456 gigawatts-thermal (GW_{TH}), with 40.2 GW_{TH} of capacity being added in 2015 (Weiss, Werner, Monika Spörk-Dür and Franz Mauthner, 2017).

During the past decade, solar thermal ordinances have been enacted by growing numbers of local governments in different parts of the world. They mandate the use of solar thermal energy to satisfy a specified minimum share of a building’s total hot water demand. An ordinance could apply to all municipal structures or to new private construction of a particular size.

Some jurisdictions have integrated SWH mandates into their energy efficiency programmes or building codes. In such cases, ordinances are an effective policy tool for local and regional governments to replace fossil fuels with renewable energy. In order to increase their effectiveness and overcome potential barriers to market development (see box) – or, as in the case of Rosario, when an ordinance only applies to municipal infrastructure – mandates for installing SWHs can be coupled with incentive schemes for communities and various stakeholders to increase the number of SWH systems installed.

Rosario is the third largest city in Argentina, with a population of approximately 960 000 and a total land area of 179 km^2 , situated within a metropolitan area of 1.3 million inhabitants that stretches over a total land area of 1 770 km^2 (Hardoy, J., V. Herrera and D. Mastrangelo, 2016).



Rosario’s measures have spurred the national SWH market

Barriers to the uptake of solar water heaters

Greater usage of SWHs faces a number of obstacles mainly related to economics, technology and public awareness.

Economic barriers encompass high capital costs and the failure to account for the externalised costs of fossil fuels. Quality and technical barriers comprise the lack of adequate quality and performance standards, certified products and qualified professionals for installation and maintenance as well as inadequate research and development, and lack of demonstration projects. Behavioural concerns include lack of awareness and even distrust within the general public, unfamiliarity of authorities with the benefits of a strong solar thermal industry and unclear representation from within the solar thermal industry.

Although many of these barriers exist – and must be overcome – at the national level, in many cases local and regional governments can play instrumental roles. Municipalities can introduce incentives including subsidies for installation, ordinances for new buildings and support measures for local SWH producers and service companies, which are key actors in addressing the above barriers.

Sources: Gelil (2007); Nienborg (2011).

Actions taken

Rosario has carried out its first GHG inventory, reported to ICLEI in 2015, but has not yet developed a climate action plan. Nonetheless, the municipality has made energy efficiency and the development of renewable energy sources priorities, with a specific focus on the building sector. Prior to passing the solar thermal ordinance for municipal buildings, in 2011 the city of Rosario developed a Sustainable Building and Energy Efficiency Programme to address the considerable projected growth of real estate investment and its concomitant expansion of GHG emissions (Impulso, 2011). The Programme was also intended as a platform to build dialogue and communication with relevant stakeholders. It includes the SWH ordinance as well as measures relating to the thermal energy and electricity demand of building stock and the promotion of solar PV installations on public buildings.

Early in the process of drafting the ordinance, a gap in technical expertise became apparent. This led to the involvement of a local non-profit environmental protection organisation, Taller Ecologista, to provide technical advice. To share relevant knowledge, Taller Ecologista, together with the municipality and the National Technology University, Rosario Regional Faculty (UTN – Universidad Tecnológica Nacional, Facultad Regional Rosario), published an installation and maintenance manual for SWH and other solar energy technologies.

The ordinance came into force in September 2012, requiring that at least 50% of hot water requirements be met by solar energy. The ordinance covers all public buildings in Rosario, including schools, hospitals, public swimming pools, buildings and social housing owned by the municipality and other government authorities.

Owing to the lack of local expertise, more than a year was needed to complete the drafting and pass the ordinance. Rosario could draw neither on existing national policy to support the development of local SWH policies (IRENA, 2015), nor on experiences and lessons learned from local ordinances elsewhere in the country. Reflecting the broader nationwide situation, the SWH market in Rosario was still in its infancy.

Capacity and subsidy challenges

A major challenge was the lack of accessible SWH knowledge and local engineers experienced in the installation and operation of SWH systems (Nienborg, 2011). To close the knowledge gap, strategic partnerships have been built with academic institutions, civil society organisations and the state government to deliver workshops and training programmes for relevant stakeholders.

Fossil fuel subsidies present a considerable barrier to the growth of the SWH market, limiting the monetary savings for households that a switch to SWH promises (IRENA, 2015). When Rosario's solar ordinance was first discussed, solar thermal energy in general was a contentious topic in Argentina, a fossil fuel-producing country. Natural gas for water heating is still competitive in Rosario because of fossil fuel subsidies.

Key conditions for the shift to solar water heaters

Strong partnerships

A broad partnership between governmental and non-governmental organisations played a significant role in developing the solar ordinance. Key actors included the Municipality of Rosario and its city council, Taller Ecologista, the Solar Cities Network of Argentina (La Red De Ciudades Solares, a network of cities aiming to promote solar energy development), the National Technology University of Argentina (UTN) and the Provincial Government of Santa Fe.

Taller Ecologista played an important role in policy advocacy. This organisation had started pushing for a solar thermal ordinance in Rosario as early as 2005, six years before the municipality became involved. It proposed to include both public and private buildings in the ordinance – a more ambitious goal than that which was ultimately passed.



Partnerships between governmental and non-governmental organisations were crucial in developing the solar ordinance

Capacity building

The municipality has offered training courses to SWH installers concerning the regulations set out in the ordinance. It has also provided training for municipal technical staff to carry out the task in public buildings and to ensure that the SWH equipment is properly operated and maintained. Furthermore, Rosario is sharing its experience, organising public outreach and education actions in different municipalities across Argentina.

Opportunities for scale-up and replication

Over 60% of the existing housing stock in Rosario is appropriately situated for solar power (Rosario Plus, 2016a). Within the Province of Santa Fe, as of 2013, 226 664 households were not connected to the natural gas network and could utilise SWHs (La Capital, 2013).

The Provincial Government of Santa Fe launched a preferential credit line through an initiative – ‘Un sol para tu techo’, (‘A sun for your roof’) – aimed at supporting the purchase of solar water heaters by all inhabitants of the province. The credit line provides up to ARS 20 000 (USD 1 360)¹ with fixed fees and preferential interest rates based on the term of the loan, which can be up to 60 months (Argentina Municipal, 2016). The initiative has also placed emphasis on growing the market for domestically manufactured SWHs and training residents of Santa Fe – through the National Institute of Industrial Technology (INTI) – to become registered installers (La Capital, 2013).



Fossil-fuel subsidies remain a barrier to SWH growth

¹ Conversion rate is based on the average exchange rate for 2016 (1 ARS = 0.068 USD), generated at: www.oanda.com/currency/average



Rosario has developed a greenhouse gas inventory

Providing renewable energy for municipality owned public buildings

Rosario's solar thermal ordinance is the first such local policy in Argentina, making the municipality a national forerunner. It serves as an inspiring example for other cities. In fact, the Solar Cities Network has been actively lobbying for similar policies in neighbouring municipalities and has proposed nationwide regulations in this regard. For instance, in May 2012 the City of Santa Fe followed in Rosario's footsteps and approved an ordinance mandating solar thermal systems in 34 nurseries under renovation (Global Solar Thermal Energy Council, 2013).

Installation of SWHs in both new and existing municipal structures has gradually increased since the ordinance's passage. More than 30 installations have been either completed or are planned. A contract was issued by the municipality in 2014 for the provision of 24 solar water heating installations deployed on civil buildings, of which 19 were for community sports centres, three for the municipal sports stadium, one for the local composting plant and one for a neighbourhood community centre. Installation of all the SWHs was completed in 2015–2016. They were then transferred to local small and medium-sized enterprises (SMEs); (City of Rosario, 2015).

SWH installation needs to be seen in the context of broader energy efficiency efforts. From 2013 to 2017, 115 new commercial and residential buildings were constructed in Rosario with a total floor space of c. 450 000 m². They needed to meet energy efficiency standards requiring that thermal performance be improved and that electricity use for air conditioning be slashed by approximately 80% compared to average demand per square meter (Rosario Noticias, 2017).

Rosario scored another first among municipalities in Argentina. Following the installation of solar PV panels at the municipal waste treatment plant and subsequently at the town hall – Palacio de los Leones – the city installed solar PV panels at all six of its district municipal offices in early 2017. More than 40% of the energy requirements at the Palacio de los Leones are now met by solar power (Rosario Plus, 2016c).

The solar thermal ordinance and the installation of SWHs – as well as other renewable energy and energy efficiency measures – are expected to have a significant impact on municipal GHG emissions.

Skills training and public awareness raising

In response to the Ordinance, the University of the Latin American Educational Centre (la Universidad del Centro Educativo Latinoamericano [UCEL]) developed an ‘energy diploma’ (Diplomatura en Energía) to train local technicians in the deployment and installation of renewable energy technologies. As of 2016, there were four SMEs in Rosario involved in the sale, installation and maintenance of SWHs (Rosario Plus, 2016b).

SWH installations have raised public awareness about the production and application of renewable energy. Rosario is facilitating community consultations and participatory workshops. It has used the opportunity of SWHs being installed in youth sports centres to organise events to communicate to children the benefits and applications of renewable energy.

Costs and funding

The municipal contract for the installation of 24 SWHs (City of Rosario, 2015) had a value of ARS 455 000 (USD 49,569).² The cost of a domestically-produced SWH in Rosario ranges from ARS 7 000 to 15 000 (about USD 430-920),³ depending on the capacity of the tank. Following recovery of the initial investment cost, SWHs offer monetary savings of more than 80% for each of the expected 15–20 years of serviceable life compared to the cost of conventional water heaters (Rosario Plus, 2016b).

In order to spur further development within the region, the city, through the Municipal Bank of Rosario and in co-operation with the Provincial Government of Santa Fe, has developed the Green Line loan programme for SMEs working on renewable energy and energy efficiency.

The Green Line loan programme has earmarked a total of ARS 40 million (USD 2.7 million)⁴ at a nominal annual rate of 17%. The loans will finance up to 80% of the total investment in projects submitted by SMEs, allotting successful applications a minimum of ARS 40 000 (about USD 2 700)⁵ to a maximum of ARS 5 000 000 (USD 340 079)⁶ with a repayment period of 12–36 months, depending on the characteristics of the project. The first edition of Green Line was launched in 2014 and funded 52 projects from a budget of ARS 71 million (about USD 8.8 million),⁷ (Energia Estrategica, 2016).



Solar water heaters offer savings exceeding 80% per year over their lifetime

² Based on yearly average for 2015 (1 ARS = 0.108 USD), generated at: www.oanda.com/currency/average

³ Based on yearly average for 2017 (1 ARS = 0.061 USD), generated at: www.oanda.com/currency/average

⁴ Based on yearly average for 2016 (1 ARS = 0.068 USD), generated at: www.oanda.com/currency/average

⁵ Based on yearly average for 2016 (1 ARS = 0.068 USD), generated at: www.oanda.com/currency/average

⁶ Based on yearly average for 2016 (1 ARS = 0.068 USD), generated at: www.oanda.com/currency/average

⁷ Based on yearly average for 2014 (1 ARS = 0.124 USD), generated at: www.oanda.com/currency/average

Lessons for other cities

A number of lessons may be drawn from the implementation of Rosario's solar thermal ordinance:

Quality assurance and standards are vital to developing a healthy market. By publishing technical specifications and maintenance standards, Rosario has taken a key step in allaying any potential public distrust of the technology. Experience indicates that the performance of a SWH depends not only on its construction but also how it is installed. Training courses and certifications for people involved in the various stages of the SWH life-cycle are invaluable.

A critical component of successfully implementing solar ordinances is communicating the practical benefits to the public, including information on the reliability, cost-competitiveness, and environmental benefits of this technology.

Public investment in demonstration projects on public buildings and facilities can facilitate the uptake of SWH technology. By passing an ordinance that requires the municipality's own operations to meet certain renewable energy standards, Rosario demonstrated its commitment to clean energy and environmental issues as well as the political feasibility of more comprehensive ordinances in the future.

Demand-side command-and-control policies can stimulate local markets, facilitate capacity building and advance the skills of the local workforce. In conjunction with several partner organisations, the Rosario municipality has hosted or supported a series of technical skill trainings and workshops, and has itself become a sought-after authority for drafting a competent SWH ordinance. Skills training and capacity building for the local workforce represent socio-economic benefits which may ultimately increase the political feasibility of more ambitious action on renewable energy deployment.



Photograph: Shutterstock

Demand-side command-and-control policies can stimulate local markets

References

- Argentina Municipal (2016)**, *Government of Santa Fe relaunches “Sun for your roof” programme (El gobierno de Santa Fe relanzó el programa “Un sol para tu techo”)*, <http://argentinamunicipal.com.ar/argentina/?p=47638>.
- City of Rosario (2015)**, *Provision and installation of solar water heaters for domestic use (Provisión e instalación de calefones solares para agua caliente sanitaria)*, www.rosario.gov.ar/sitio/licitaciones/detalleLicitacion.do?id=10972, accessed June 2017.
- Energia Estrategica (2016)**, *40 million-peso Green Line loan for SMEs relaunched (Se relanza la Línea Verde de Créditos para PyMEs por un monto de 40 millones de pesos)*, www.energiaestrategica.com/se-relanza-la-linea-verde-creditos-pymes-monto-40-millones-pesos/, accessed June 2017.
- Gelil, I. (2007)**, *Framework Conditions for Solar Thermal Energy Use in the Southern Mediterranean Countries SOLATERM Project Report*, www.researchgate.net/publication/230635420_Framework_Conditions_for_Solar_Thermal_Energy_Use_in_the_Southern_Mediterranean_Countries_SOLATERM_Project_Report, accessed June 2017.
- Global Solar Thermal Energy Council (2013)**, *Argentina: Other Municipalities Follow Frontrunner City Rosario*, www.solarthermalworld.org/content/argentina-other-municipalities-follow-frontrunner-city-rosario, accessed June 2017.
- Hardoy, J., V. Herrera and D. Mastrangelo (2016)**, “Rosario, Argentina”, in S. Bartlett and D. Sattwerthwaite, eds., *Cities on a finite planet*, Oxford, Routledge, pp. 185–199.
- ICLEI (2014)**, *Using solar energy – supporting community energy self-sufficiency, Barcelona, Spain*, ICLEI Case Study, Local Governments for Sustainability, December 2014.
- Impulso (2011)**, *Municipality proceeds with sustainable building and energy efficiency programme (La Municipalidad avanza con el Programa de Construcciones Sustentables y Eficiencia Energética)*, www.impulsonegocios.com/contenidos/2011/04/14/Editorial_12610.php, accessed June 2017.
- Weiss, Werner, Monika Spörk-Dür and Franz Mauthner, (2017)**, *Solar Heat Worldwide, International Energy Agency – Solar Heating & Cooling Programme*, www.iea-shc.org/data/sites/1/publications/Solar-Heat-Worldwide-2017.pdf.
- IPCC (2007)**, *Solar thermal energy for heating and hot water, Intergovernmental Panel on Climate Change*, www.ipcc.ch/publications_and_data/ar4/wg3/en/ch6-ens6-4-7-2.html, accessed June 2017.
- IRENA (2015)**, *Quality Infrastructure for Renewable Energy Technologies Solar Water Heaters*, International Renewable Energy Agency, www.irena.org/DocumentDownloads/Publications/IRENA_QI_3_SWH_2015.pdf, accessed June 2017.
- La Capital (2013)**, *Loan now available to buy solar water heaters (Ya funciona una línea de créditos para comprar calefones solares)*, www.lacapital.com.ar/la-region/ya-funciona-una-linea-creditos-comprar-calefones-solares-n423519.html, accessed June 2017.
- Nienborg, B. (2011)**, *Solar Thermal Water Heaters in Argentina Market Characterization and Analysis of Barriers to Diffusion*, www.zee-uni-freiburg.de/fileadmin/PDF/Nienborg_Working_Paper_ZEE.pdf, accessed June 2017.
- Notife (2016)**, *Rosario to use renewable energy in public buildings (Rosario utilizará energías renovables en edificios públicos)*, <http://notife.com/477184-rosario-utilizara-energias-renovables-en-edificios-publicos>, accessed June 2017.

OECD (2017), *Argentina, Organisation for Economic Co-operation and Development*, www.oecd.org/environment/cc/g20-climate/collapsecontents/Fiel-argentina-growth-and-low-carbon-transition.pdf, accessed October 2017.

Rosario Noticias (2017), *More than 100 new buildings incorporate energy-saving construction methods (Más de 100 nuevos edificios ya incorporaron técnicas constructivas para el ahorro energético)*, www.rosarionoticias.gob.ar/page/noticias/id/79902/title/M%C3%A1s-de-100-nuevos-edificios-ya-incorporaron-t%C3%A9cnicas-constructivas-para-el-ahorro-energ%C3%A9tico, accessed June 2017.

Rosario Plus (2016a), *60% of Rosario homes can capture solar energy (El 60% de las viviendas de Rosario puede captar energía solar)*, www.rosarioplus.com/ensacoycorbata/El-60-de-las-viviendas-de-Rosario-puede-captar-energia-solar-20160614-0039.html, accessed June 2017.

Rosario Plus (2016b), *Consultations initiated on solar power generation (Se dispararon las consultas para poder generar energía solar)*, www.rosarioplus.com/ensacoycorbata/Se-dispararon-las-consultas-para-poder-generar-energia-solar-20160613-0035.html, accessed June 2017.

Rosario Plus (2016c), *Districts to be powered by solar energy (Los distritos ahora se sustentarán con energía solar)*, www.rosarioplus.com/ensacoycorbata/Los-distritos-ahora-se-sustentaran-con-energia-solar-20170223-0033.html, accessed June 2017.

Copyright © IRENA 2018

Unless otherwise stated, material in this publication may be freely used, shared, copied, reproduced, printed and/or downloaded, provided that appropriate acknowledgement of IRENA as the source and copyright holder is given. Material attributed to third parties may be subject to third-party copyright and separate terms of use and restrictions.

Acknowledgements

This case study was prepared in co-ordination with ICLEI, under the guidance of Rabia Ferroukhi (IRENA). Content was authored by Pourya Salehi, Michael Woodbridge (ICLEI), Jinlei Feng, Ghislaine Kieffer, Verena Ommer and Michael Renner (IRENA). The study also benefited from expert reviews by Sergio Barrios (Municipality of Rosario), Nicholas Goedeking (University of California – Berkeley) and Daniela Mastrangelo (Municipality of Rosario), along with ICLEI colleagues Miriam Badino, Bruna Cerqueira and Carla Marino and IRENA colleagues Celia García-Baños and Laura El-Katiri.

Disclaimer

This publication and the material herein are provided “as is”. Neither IRENA nor any of its officials, agents, data or other third-party content providers provides warranty of any kind, either expressed or implied, and they accept no responsibility or liability with regard to the use of this publication and the material featured therein.

The information contained herein does not necessarily represent the views of the Members of IRENA. The mention of specific companies or certain projects or products does not imply that they are endorsed or recommended by IRENA in preference to others of a similar nature that are not mentioned. The designations employed and the presentation of material herein do not imply the expression of any opinion on the part of IRENA concerning the legal status of any region, country, territory, city or area or of its authorities, or concerning the delimitation of frontiers or boundaries.