WINDOW FILM-ENERGY IMPACTS AND OPPORTUNITIES

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BACKGROUND

- IWFA is non-profit trade association (www.iwfa.com) representing manufacturers, distributors, and dealers worldwide
- IWFA manufacturer members are over 80% of world's total window film production
- Estimated 7,000 small business owners in U.S. selling window film
  - Small businesses; employing 3-25 people
    - Over 750 located in Texas
    - IWFA Regional Conference - Feb 28-March 2 in Arlington
- Best practice protocols
  - Installation: IWFA Visual Quality Standards
  - Representation: Advertising and Ethics Policies

WINDOW FILM USES

Safety & Security

Window Graphics

Interior Fade Protection

WINDOW FILM USES

Residential

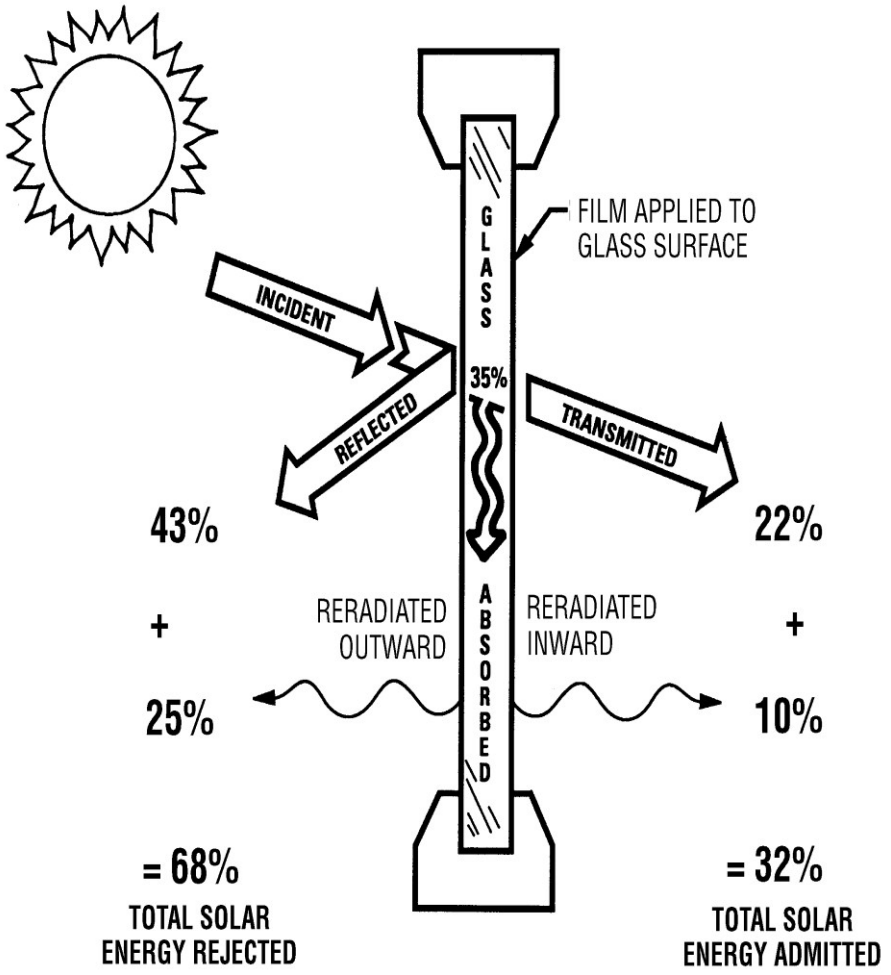
Commercial

Automotive

GENERAL BENEFITS OF WINDOW FILMS

- Control/reduce heat gain
- Reduce radiant heat loss
- Provide shatter resistance
- Provide protection from ultraviolet energy
  - -for personal protection
  - -for fade reduction
- Create desired privacy
- Create uniform appearance
- Balance hot/cold spots in buildings
- Reduce glare

HOW ENERGY CONTROL FILM WORKS



Presented to: Texas State Agency Energy Advisory Group

TECHNICAL CHANGES IN ENERGY CONTROL FILMS

- **Adhesive System**

  Changed from single pressure sensitive system for all films to series of unique adhesive systems all designed for specific end uses and all with UV-stability

- **Coloration Method**

  Moved from dyeing and color coating of single layers to using multiple colored layers and to added layers of metallized layers with color imparted by type of metal used with at least outward layer having UV-stability

- **Metallization Process**

  Evolved from use of only vacuum metallizing, which is limited to a single pure metal per layer, to a sputter deposition process, which allows for not only alloys to be used instead of pure metal but also allows multiple alloys/metals to be used on a single layer of film

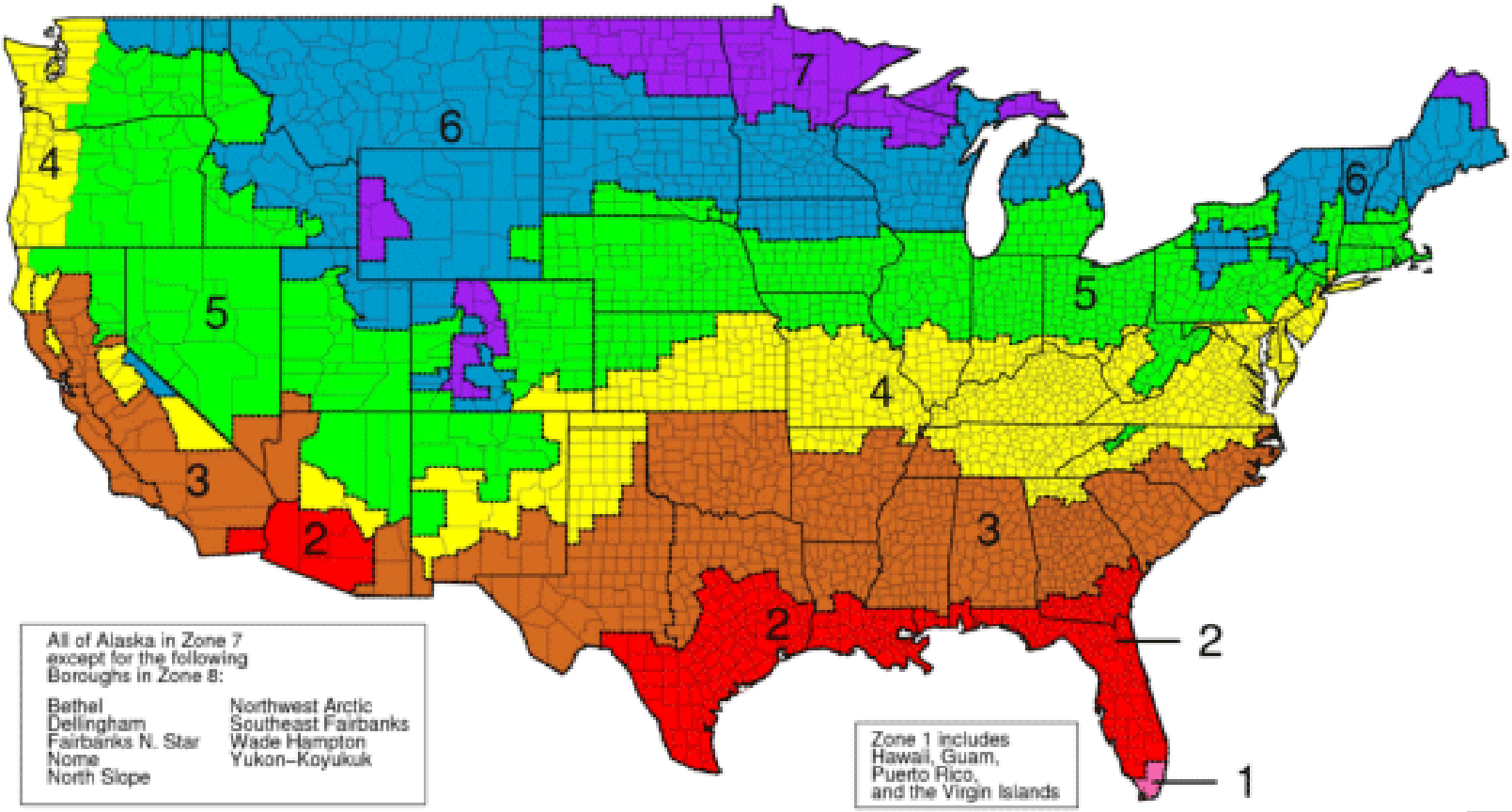
- **Warranty**

  10-year warranties minimal on most window film products, many 20-year, some residential lifetime

IWFA CERTIFICATIONS

- NFRC 100 -2010: Determining Fenestration Product U-Factors
- NFRC 200-2010 – Determining SHGC and VT at Normal Incidence
- Over 250 films NFRC- certified for use in residential and commercial markets

IECC CLIMATE ZONES



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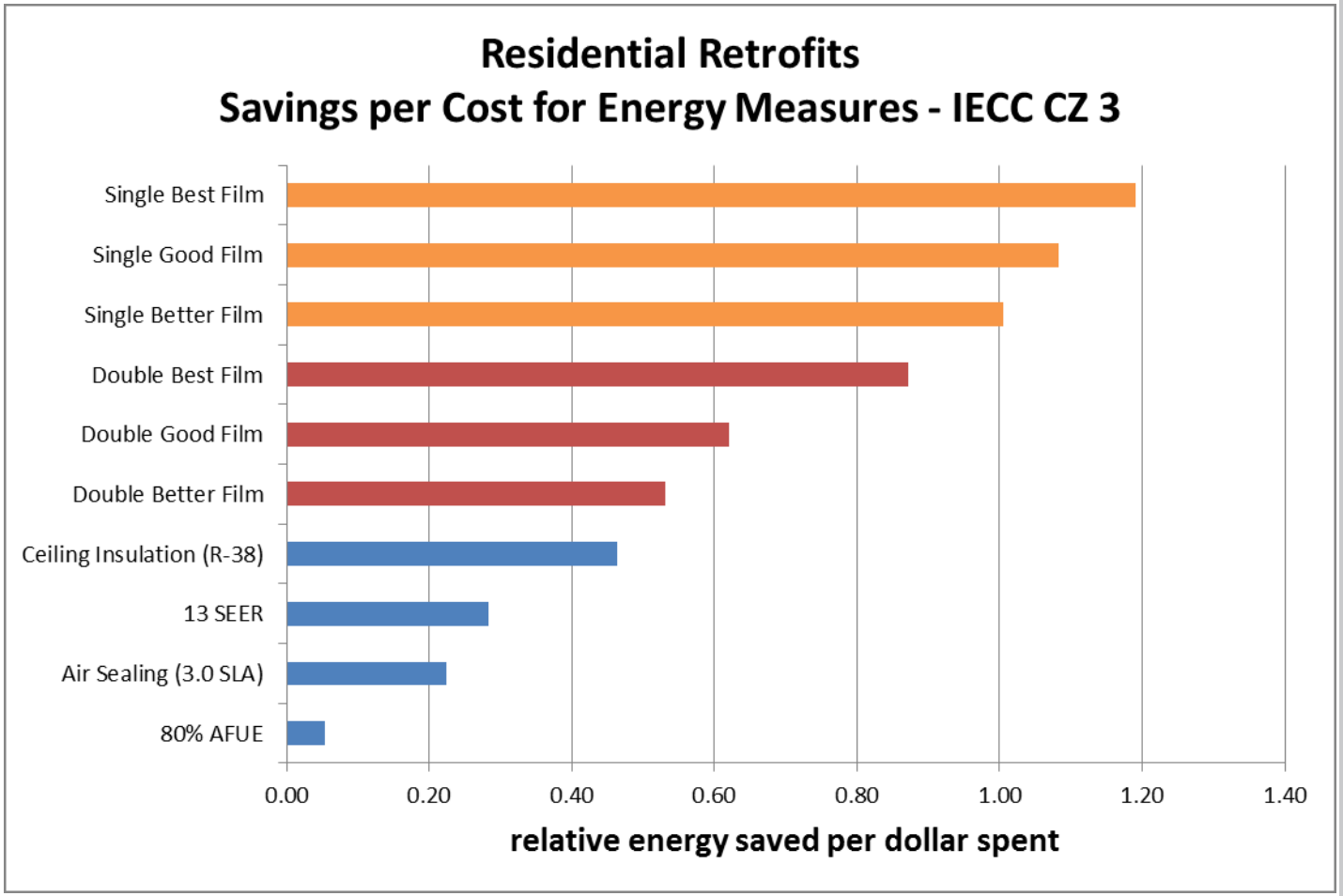
EXISTING HOUSING ENERGY IMPACT



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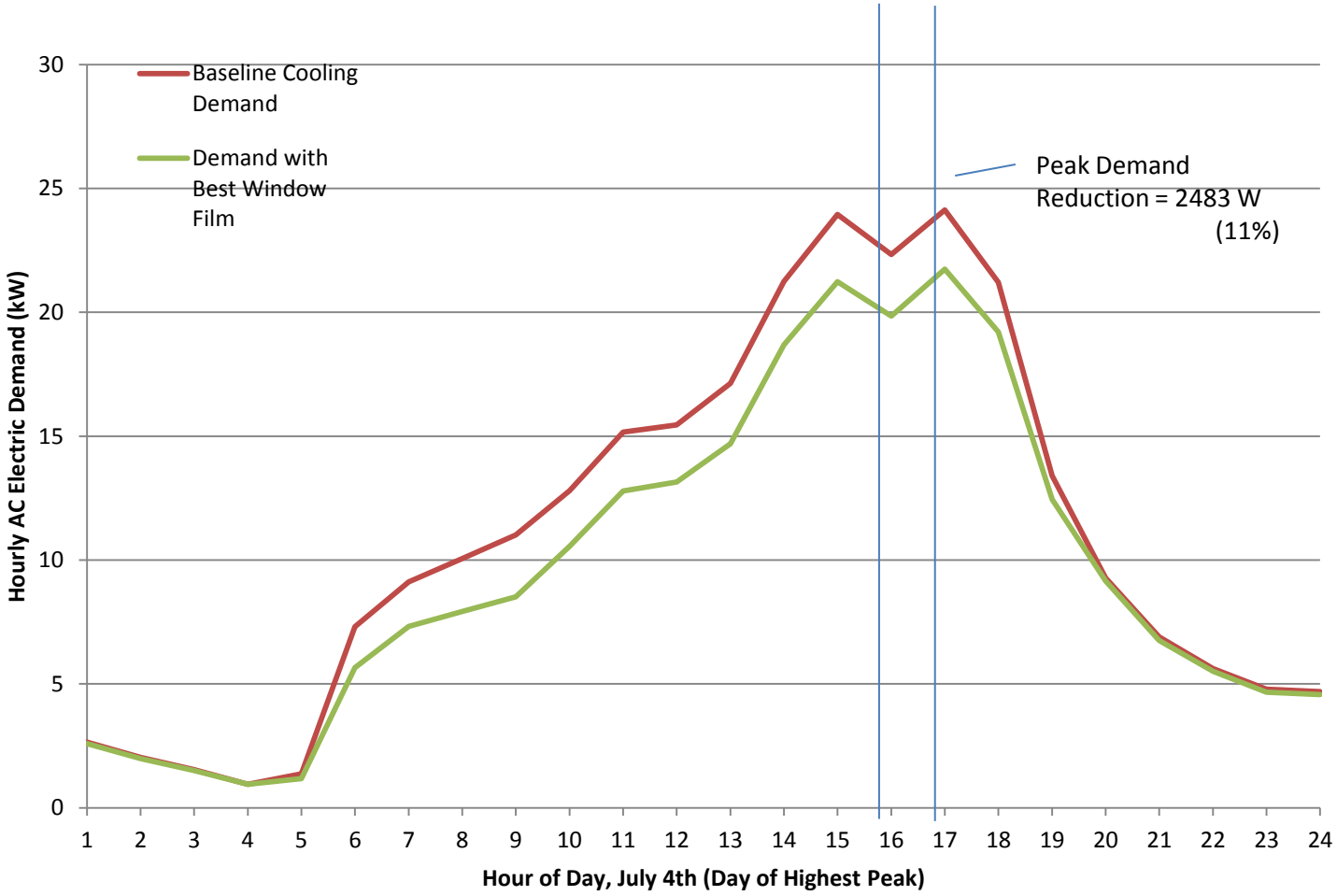
EXISTING HOUSING-WINDOW FILM IMPACT ON PEAK LOAD



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EXISTING OFFICE BUILDING ENERGY IMPACT

DOE Office Building Benchmark
500,000 sq.ft. Office Building – 1980s
IECC Climate Zone 3

Single Pane Windows	Good	Better	Better U	Best	Best U
Total Electricity	5519	5469	5482	5195	5233
Total Gas	690	663	644	626	611
Energy Cost	$828,479	$821,087	$823,014	$779,931	$785,633
Annual Savings	$86,630	$94,021	$92,094	$135,178	$129,475
Cost of Film	$199,614	$199,614	$274,469	$199,614	$349,325
Annual ROI	**43%**	**47%**	**34%**	**68%**	**37%**
Simple Payback (yrs)	**2.3**	**2.1**	**3**	**1.5**	**2.7**

EXISTING SCHOOL BUILDING ENERGY IMPACT

DOE School Building Benchmark
Model Elementary School

CIECC Climate Zone 3

Single pane windows	Better U window film
Total Electricity Use	3,188,198 kWh
Total Gas Use	21,283 therms
Energy Costs	$499,512
Annual Savings	$25,377
Install Cost of Film	$123,684
Return on Investment (ROI)	**21%**
Simple Payback	**4.9 years**

SUMMARY OF WINDOW FILM AS AN ENERGY SOLUTION

- Proven technology

  -over 250 window films already NFRC-certified

- Cost effective

  -energy studies document substantial savings for homes, commercial buildings, and schools

- Readily available

  -over 750 small local retail outlets in Texas alone

- Environmentally preferable

  -increases useable life of existing window

  -has lower carbon footprint to produce than alternatives

IWFA SUPPORT PROGRAMS

- Training
  - -Basic-Flat Glass Education Guide
  - -Advanced-Solar Control Guide
  - -E*film*-software and analytics
- Certifications
  - -Automotive Film Specialists
  - -Safety/Security Film Specialists
  - -Solar Control Specialists
  - -Advanced Solar Control Specialists
- Technical Material
  - -Installation and Inspection Guidelines
  - -Consumer Information

NEW WINDOW/GLASS TOOLS AVAILABLE

- Measure glass, air space and overall IG thickness digitally
- Detect low-E coatings
- Differentiate hard coat/soft coat
- Identify number of soft coat silver layer

E*FILM*® ENERGY ANALYSIS SOFTWARE

- Base simulation engine is EnergyPlus from DOE
- Can input actual values or use built-in default values
- Can calibrate base case to actual utility costs
- Can run for base case and 5 alternatives in single simulation run
- Get customization written report showing payback, return on investment, and peak demand

  -with and without film

  -by month and by year
- Each IWFA manufacturer has its own version for its branded product
- IWFA preparing public version based on generic product categories

SCREENSHOT EXAMPLE FROM E*FILM*® REPORT

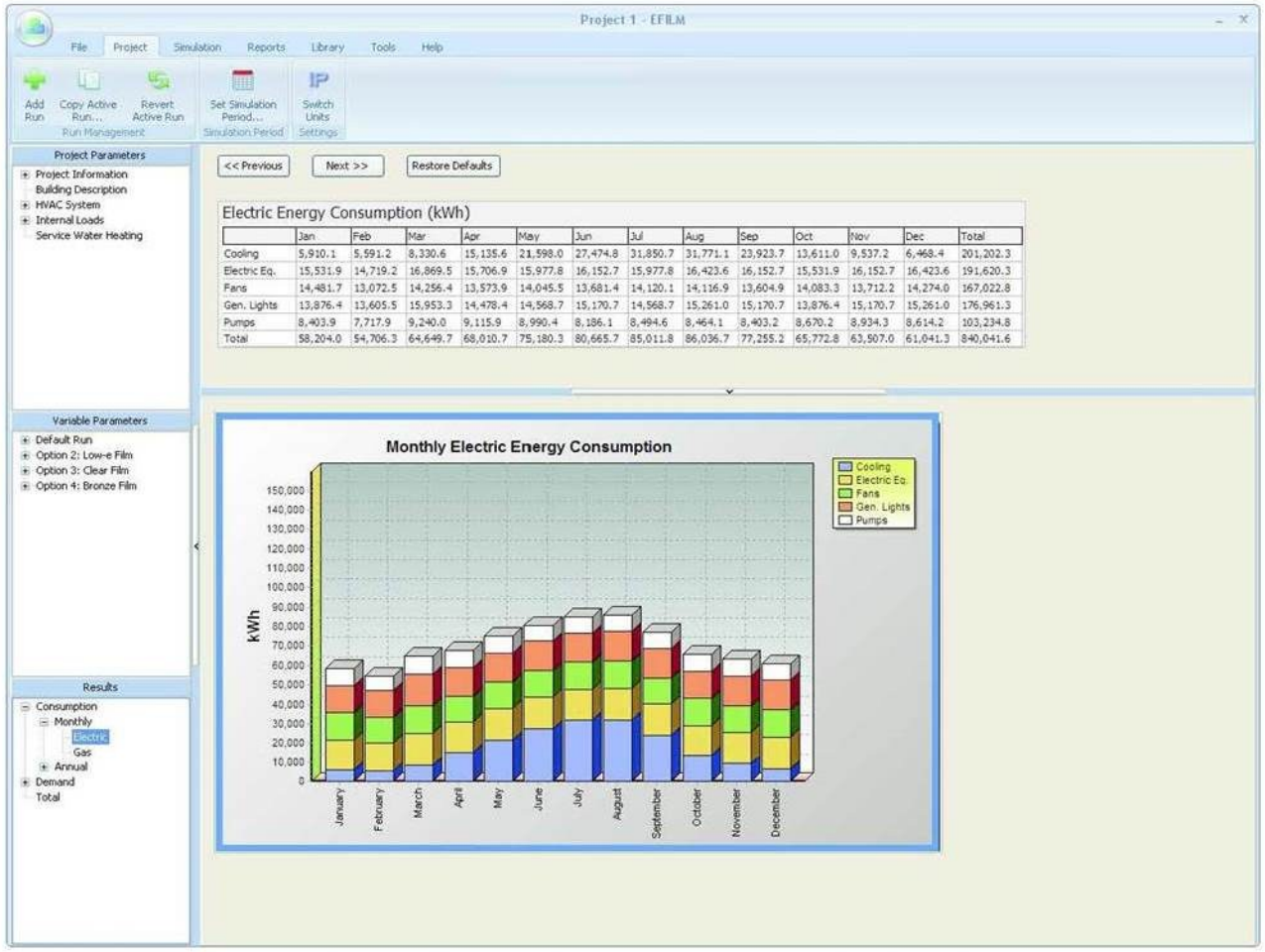
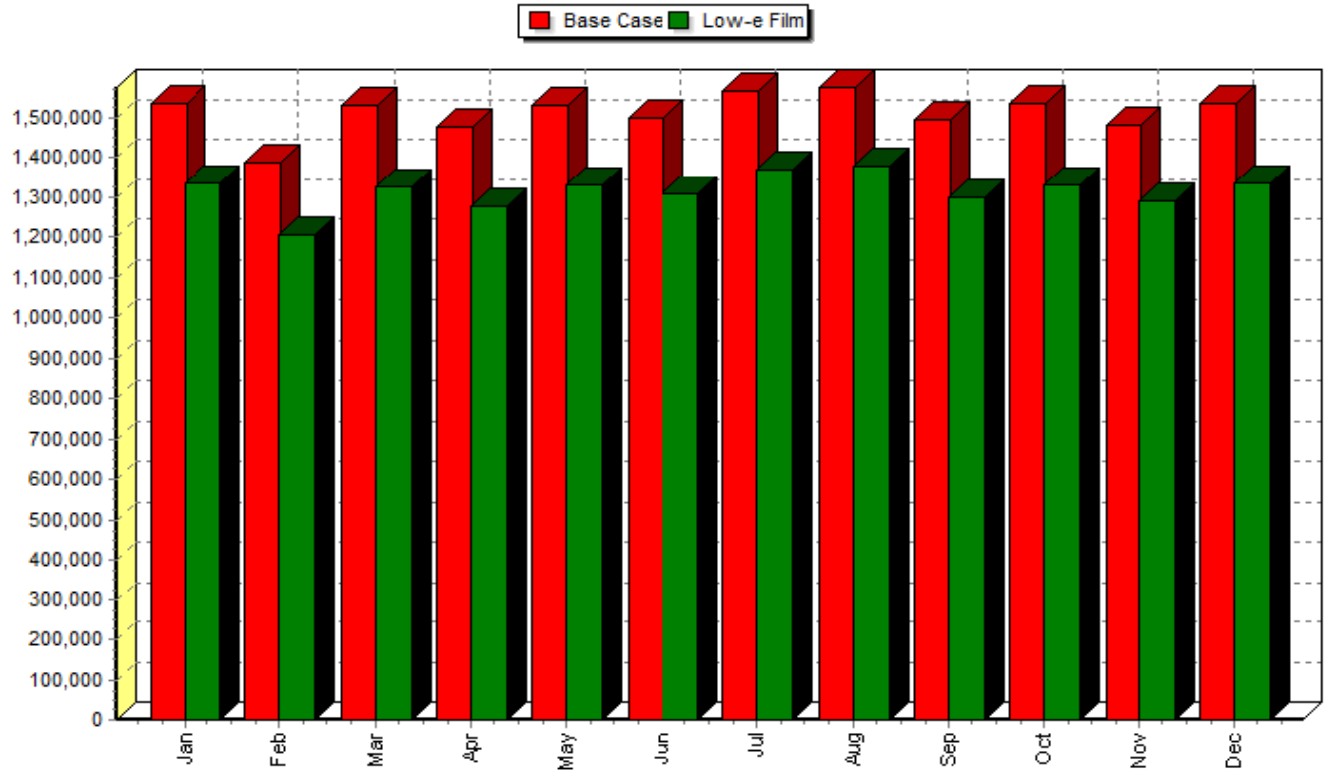


Figure 14._Monthly Electric Energy Consumption – Single Run Screen

Comparison Report

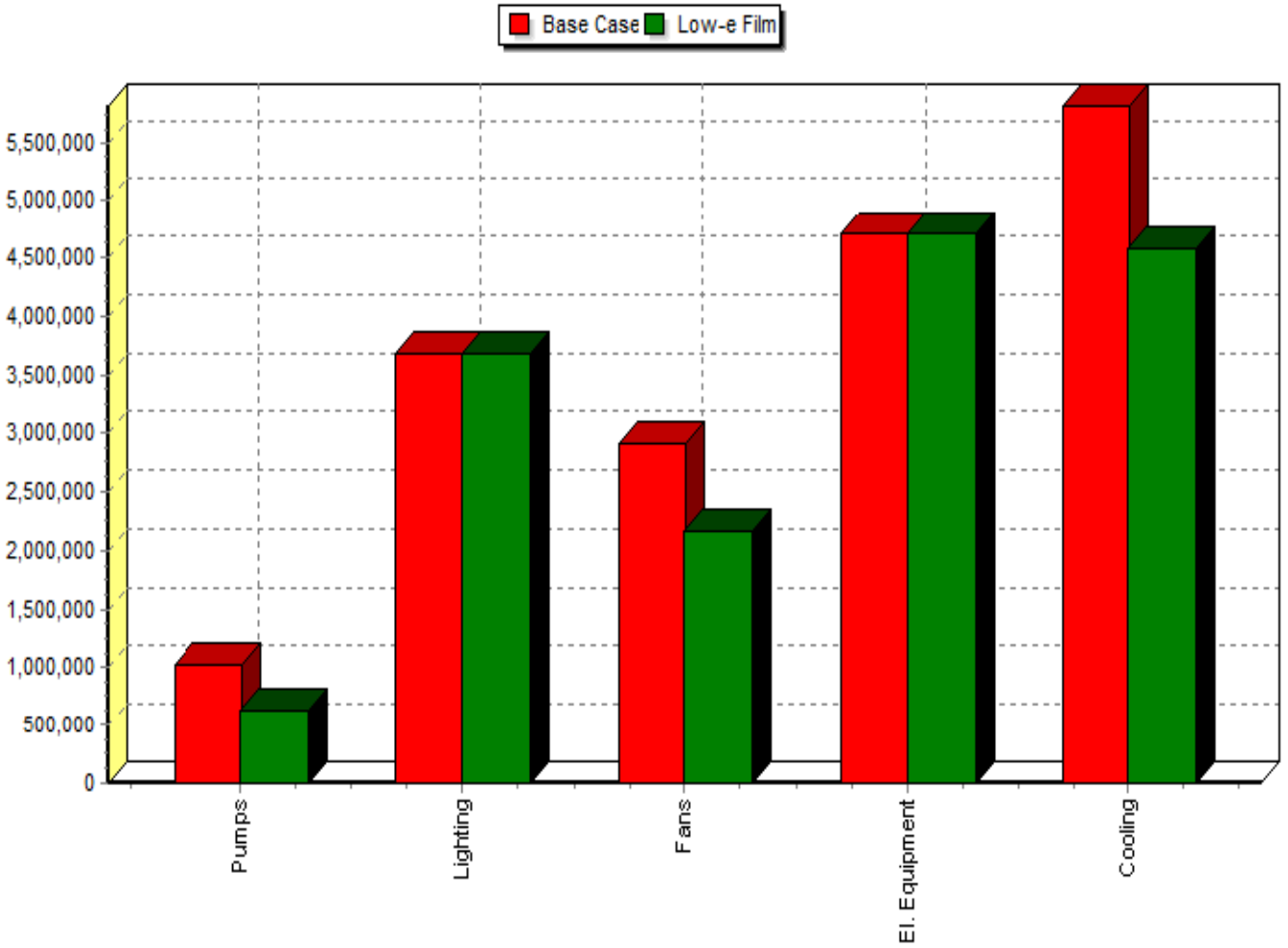
Monthly Electric Use [kWh]



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Base Case	1,534,753	1,386,565	1,530,505	1,476,456	1,531,028	1,497,509	1,566,694	1,574,660	1,492,420
Low-e Film	1,334,453	1,204,631	1,327,170	1,277,775	1,328,576	1,306,631	1,369,546	1,377,800	1,299,788
Low-e Film - Savings	200,301	181,934	203,335	198,681	202,452	190,878	197,148	196,860	192,632

INTERNATIONAL WINDOW FILM ASSOCIATION

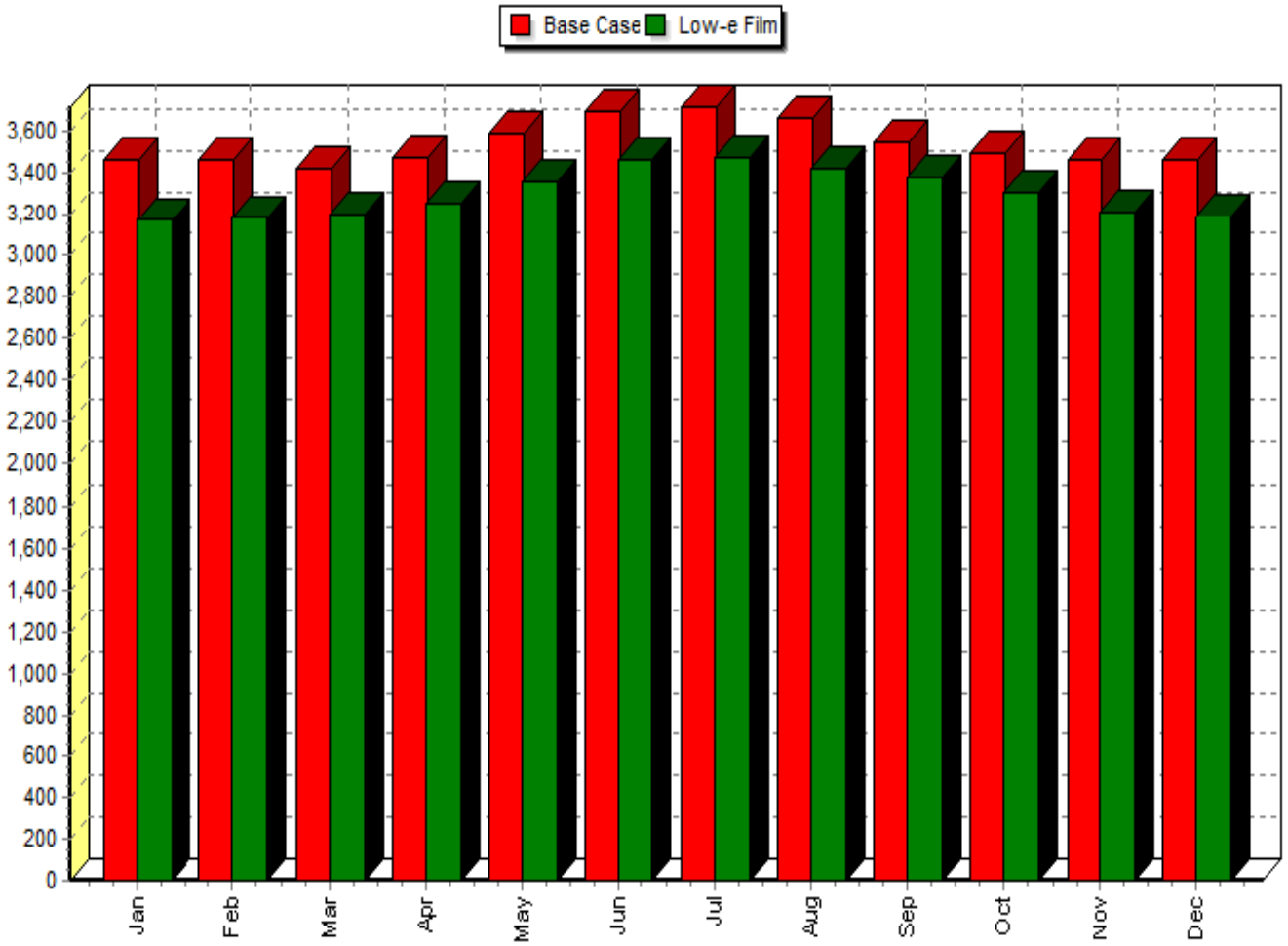
Annual Electric Use [kWh]



	Cooling	El. Equipment	Fans	Pumps	Lighting	Total
Base Case	5,810,903	4,701,803	2,914,819	1,032,697	3,681,411	18,141,632
Low-e Film	4,584,358	4,701,803	2,170,879	638,881	3,681,411	15,777,331
Low-e Film - Savings	1,226,544		743,940	393,816		2,364,301

INTERNATIONAL WINDOW FILM ASSOCIATION

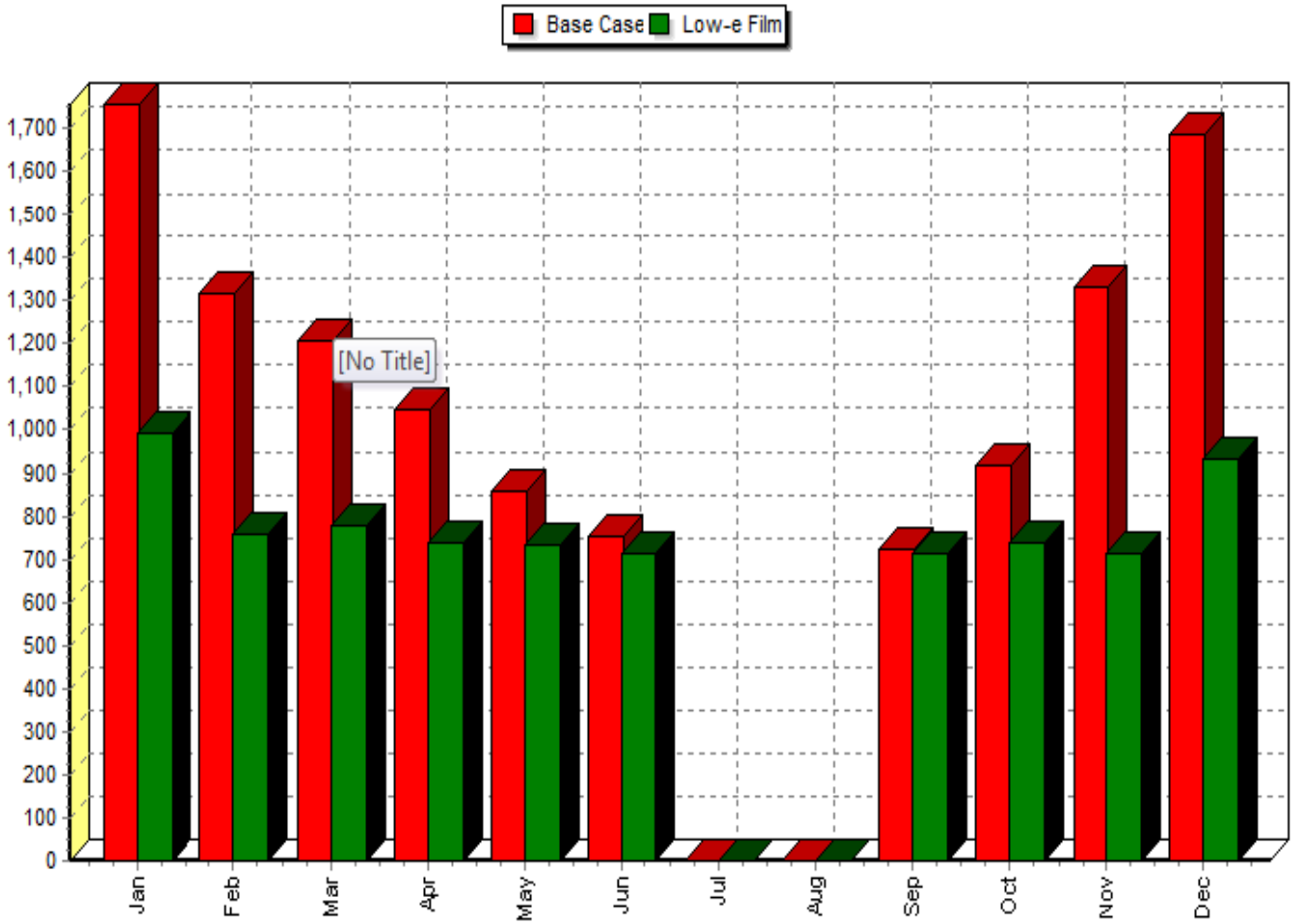
Monthly Electric Energy Demand [kW]



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Maximum
Base Case	3,460	3,460	3,424	3,478	3,590	3,698	3,716	3,659	3,545	3,491	3,460	3,460	3,820
Low-e Film	3,170	3,178	3,206	3,256	3,358	3,462	3,471	3,426	3,376	3,308	3,214	3,188	3,474
Low-e Film - Savings	290	281	218	221	232	237	245	233	169	184	246	272	345

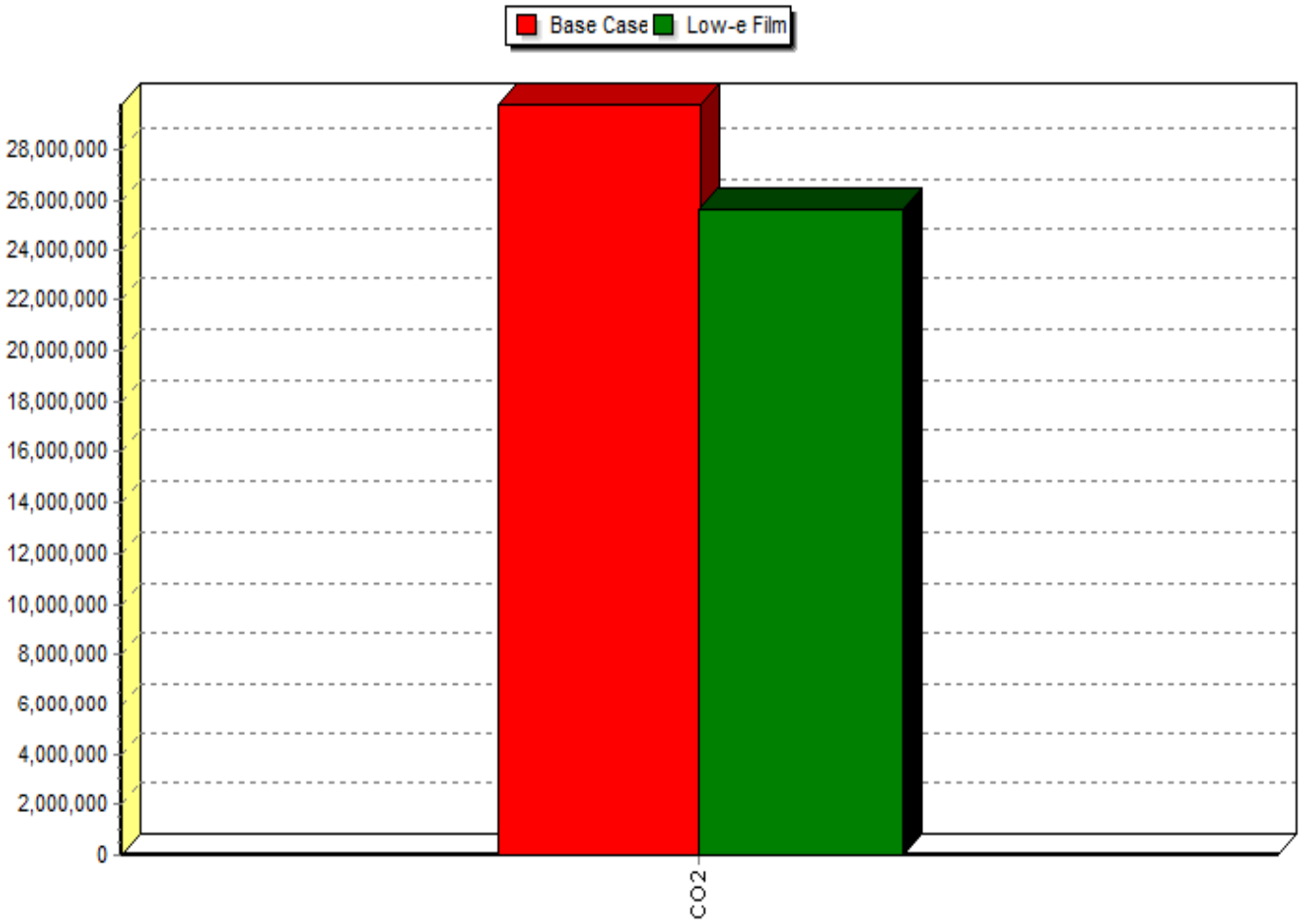
INTERNATIONAL WINDOW FILM ASSOCIATION

Monthly Gas Use [MBTU]



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Base Case	1,756	1,314	1,205	1,048	857	755	1	1	722	918	1,331	1,687	11,595
Low-e Film	993	761	778	740	736	713	1	1	713	737	713	934	7,819
Low-e Film - Savings	763	553	427	309	121	43	1	0	9	182	619	752	3,776

Annual CO2 [lb]



	CO2	Total
Base Case	29,798,782	29,798,782
Low-e Film	25,640,720	25,640,720
Low-e Film - Savings	4,158,061	4,158,061

QUESTIONS